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Electrolysis From Stray Electric Currents.

[A Lecture Delivered before the American Water Works Association at Louisville, Ky., June 6th, 1912, By ALBERT F. GANZ, M. E., Professor of Electrical Engineering, Stevens Institute Technology, Hoboken, N. J.]

Definition and Theory of Electrolysis—Electric currents may be conducted in two ways: First, by metallic conduction; and, second, electrolytic conduction. Metallic conduction occurs when an electric current passes through a metal, and is characterized by the fact that no chemical change is produced in the conductor, the only effect being the production of heat. Where electric currents, therefore, pass through metallic conductors, such as copper wires, rails, or pipes, they produce no change in these conductors except to raise their temperature. Under all ordinary conditions stray electric currents found on underground pipes are not sufficiently large to appreciably heat these pipes. Under abnormal conditions pipes may, however, carry stray currents of sufficient magnitude to produce heating at moderately high resistance joints.

Electrolytic conduction occurs when an electric current passes through an electrolyte, and is characterized by the fact that the electric current is transmitted by a corresponding transfer of *ions* in solution, with the production of chemical decomposition at the electrodes where the current enters and leaves the electrolyte. Electrolysis may, therefore, be defined as chemical decomposition produced by an electric current. Electrolysis is usefully applied in the arts for the refining of metals and for producing chemical compounds. I want to discuss here the destruction of underground structures caused by electrolysis from stray electric currents which reach these structures.

Chemical compounds in solutions of water constitute the ordinary electrolytic conductors. Pure water itself has such a high resistance that it may practically be considered a non conductor. It is for this reason that an iron pipe full of ordinary city supply water does not have a lower resistance than the same pipe without water. Water is, however, readily made conducting by the addition of small amounts of salts, and conduction through water is, therefore, always electrolytic.

The following is a brief explanation of the theory of electrolytic conduction. When a salt is dissolved in water, some of the molecules separate or dissociate into two parts, one part having a positive electrical charge, and the other a negative electrical charge, and these parts are called *ions*. The metal parts, or the hydrogen, constitute the positive ions, and the acid parts the negative ions. For instance, copper sulphate $CuSO_4$, when dissolved in water, dissociates into the positive metal ion, Cu, and the negative acid ion, SO_4. An electric current is transmitted through an electrolyte by the transfer of these ions. The electrode by which the current enters the electrolyte is called the *anode*, and the one by which the current leaves is called the *cathode*. The metal or hydrogen (positive) ions travel in the direction of the current and carry positive electrical charges to the cathode, and these metal ions, called cations, are deposited upon or are liberated at the cathode. The acid (negative ions) travel against the current and carry negative electrical charges to the anode, and these acid ions, called anions, will corrode the anode if it is a metal which combines chemically with these anions. The cathode is not corroded. With an electrolyte of copper sulphate dissolved in water, a copper anode corrodes into copper sulphate and dissolves, while metallic copper is deposited upon the cathode. If the electrolyte is common salt dissolved in water, the anions are chlorine, and an iron anode would be corroded, the iron forming ferrous chloride; the cations are sodium, and these would decompose the water present and liberate hydrogen at the cathode. These examples furnish an illustration of the fact that the corrosive action of the current results in supplying the electrolyte with an equivalent of the amount of salt decomposed by the current, so that the electrolyte is continually replenished with salt and its electrolytic conducting power is thereby maintained. The salt will contain metal ions of the anode or hydrogen and may be different from the original salt which started the action.

Street soils when entirely dry do not conduct electric currents. Under ordinary conditions, however, street soils contain considerable water with salts in solution, generally chlorides, and this makes them electrolytic conductors. When an electric current passes through soil it, therefore, does so by electrolytic conduction and by corresponding chemical decomposition of the electrodes. Where an electric current leaves an iron pipe for soil it corrodes the iron by this action of electrolysis. It has been claimed in the past that soils may conduct metallically, but this has been disproved and it is now recognized that conduction of electric current through soil is always electrolytic.

The rate at which ions are liberated at the electrodes is proportional to the current strength. With an oxidizing anode, such as iron or lead, the mass of anode corroded by one ampere in one second is equal to the electro-chemical equivalent of the metal of the anode.

This is 0.00029 gram for iron (ferrous). For this the mass of iron corroded by one ampere in one year is 0.00029 × 60 × 60 × 24 × 365 × 0.002205 = pounds (approximately). The electro-chemical equivalent for lead is 0.0010718 gram, and the mass of lead corroded by one ampere in 1 year is 0.0010718 × 60 × 60 × 24 × 365 × 0.002205 = 74 pounds (approximately).

The separation of the metal or hydrogen ion from the electrolyte at the cathode absorbs energy from the electric circuit, and generally produces an electromotive force in the opposite direction to the current. The oxidation of the anode supplies energy to the circuit and generally produces an electromotive force in the direction of the current. If the oxidizing anode is of the same metal as is being deposited upon the cathode, and if the electrolyte is the same at the anode and cathode, then there is no resultant electromotive force due to the electrochemical actions, and the only electromotive force consumed is that due to the resistance of the electrolyte in accordance with Ohm's Law, exactly as with a metallic conductor. If the metal deposited at the cathode is different from that oxidized at the anode, or if hydrogen is liberated at the cathode, or if the electrolyte at the cathode is not of the same composition or density as at the anode, then there will be a resultant electromotive force, which may be either in the same or in the oppoeite direction as the current. It has been assumed by some writers in the past that no corrosion from electrolysis can take place if the voltage between two metallic conductors in soil, such as between pipe and rails, is less than 1.5 volts, because this is the dissociation voltage of water. This, however, is entirely wrong, for it has been proven by investigations, and is now generally recognized, that the amount of corrosion produced by electrolysis is independent of the voltage, except in so far as this determines the amount of current flowing, and that the smallest fraction of a volt can produce corrosion from electrolysis under suitable conditions.

Sources of Stray Electric Currents.—Stray currents are electric currents which leaked from grounded electrical distribution systems and flow through ground and through underground structures. Grounded telephone and telegraph lines produce electric currents through ground of such very small magnitude that their effects upon underground piping systems can be neglected. Direct current electric lighting systems in which the distribution is on the Edison 3-wire plan with the neutral conductor grounded, are in American practice provided with such large neutral conductors of copper that practically no stray currents are produced from such system. This grounding of the neutral in Edison 3-wire system is to serve as a safeguard, and is not for the purpose of using the ground to carry current. Alternating current lighting systems where grounded generally also produce only small stray currents, and the electrolytic effects from these small, stray alternating currents are always negligible.

Electric railways using the running tracks for return conductors often produce comparatively large stray electric currents through ground, and these are the only source of stray currents which need be considered in practice. Direct current is almost exclusively used for such electric railways, and it is the common practice to supply current to the cars from an overhead trolley wire, or from a third rail, and to return this current to the power station through the running tracks, supplemented where necessary by return feeders. A single trolley electric railway is shown diagrammatically in Fig. 1,

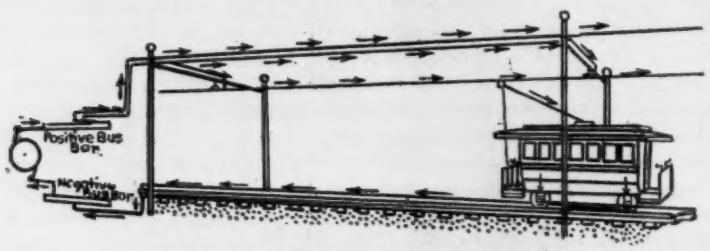

Fig. 1.—Diagram of Single Trolley Electric Railway, Showing Path of Current from Generator Through Positive Feeders, Trolley Wire, Car and Rails.

in which the path of the electric current from the positive terminal of the generator through the circuit and back to the negative terminal is shown. The running tracks consist of rail lengths about 40 feet long, and these are mechanically fastened together by fishplates, which consist of steel plates bridging across the rail ends and bolted to both rails. Such fishplates, while mechanically fastening the rail lengths together, do not form good electrically conducting connections between the successive rail lengths. For this reason copper wire or straps, called rail bonds, are generally used to bridge across the abutting ends of the rail lengths for the purpose of affording a good electrically conducting path between successive rail lengths. The two rails of a single track road, or the four rails of a double track road, are also generally connected together at frequent intervals by cross-bonds, so that the two or the four rails may be available for the return of current. Instead of using copper rail bonds, the rail ends are sometimes welded together, or soft steel plates are welded across each side of the abutting rail ends, thus forming both a strong mechanical and a good electrically conducting connection between the successive rail lengths. A well bonded railway track should have a conductivity not less than 80 per cent. of the equivalent conductivity of continuous rails. To give some idea of the relative conductivity of steel rails, it may be stated that a single rail, weighing 90 pounds per yard, which is a size commonly used where the traffic is heavy, has about the same conductivity as a copper wire 1 inch in diameter. Thus the two rails of a single track line, or the four rails of a double-track line, laid with 90-pound rails and well bonded, afford a good conducting path for electric current.

In the simplest form of single trolley railway, already shown in Fig. 1, the rails are connected to the negative terminal of the generator at the power station, and the only path for current to return to the power station is by way of the running tracks. If the running tracks are laid upon wooden ties, above ground, with broken stone for road ballast, as is common on steam railroads which run on their own right-of-way, the rails do not come in direct contact with ground, and the return current will be practically confined to the running tracks. If, however, the running tracks are laid below ground so that the top of the rails is on the level of the surface of the street, as is common in cities, then the rails will be exposed for a considerable area to contact with soil. If the tracks are laid on a concrete base a considerable area of area of the rails will similarly be in contact with the concrete. Since both damp soil and damp concrete are under ordinary conditions conductors of electricity, part of the current returning through the rails will shunt from the rails through the surrounding soil, as illustrated diagrammatically in Fig. 2. It

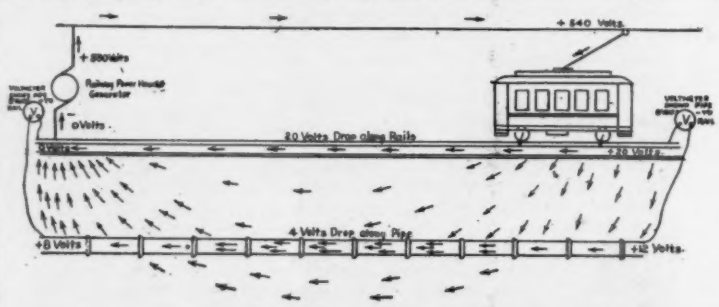

Fig. 2. Diagram Showing Stray Railway Currents with Assumed Distribution of Potentials Caused by these Currents.

will be seen that, with the usual connection of positive terminal of the generator to the trolley wire, and the negative terminal to the rails at the power station, the current will leave the rails for ground at points distant from the power station, and return to the rails in the neighborhood of the power station in its path back to the negative terminal of the generator. Since every electric circuit must be completely closed, all current escaping through ground must again leave ground to return to the dynamo so as to complete the electric circuit. Where underground metallic structures, such as gas or water pipes, lie in the ground in the path of these stray currents, and where these pipes have electrically conducting joints, such as lead calked joints or screw coupling joints, current will flow from ground to such pipes and flow largely on such pipes in a direction towards the power station In the neighborhood of the power station this current will leave the pipes to return to the negative terminal of the generator, shown in Fig. 2.

If the negative terminal of the generator or negative bus bar is connected to the rails at other points than at the power station, by means of negative return feeders, then at such connection points the rails will be rendered negative in potential to ground, and currents will tend to flow from underground pipes through ground to return to the rails in the neighborhood of these connections. Stray railway currents on pipes will, therefore, tend to leave these pipes to return to the rails in all regions where these rails are connected to return feeders.

It must be noted that, while ordinary soil is a conductor of electricity, compared with metals its electrical resistance is enormously high; for instance, the resistance between the opposite faces of a

foot cube of ordinary soil may measure anywhere from 10 to 1,000 ohms, depending upon the amount of moisture and the amount of salts in the soil, while the resistance of a foot cube of iron is equal to about 0.000 000 4 ohm; if, therefore, we take an average value of 100 ohms for the resistance of a foot cube of soil, it is seen that soil has a resistance which is of the order of 250,000,000 times as great as a body of iron of the same dimensions; that is to say, the conductivity of iron is 250,000,000 times as great as ordinary soil. It would seem from this that current would flow almost entirely on the good conducting rails and none through the high resistance ground. Resistance, however, varies directly as the length and inversely as the cross-section of a conductor, and with the large surface of rails exposed to the ground, the cross-section of the path of the current through ground is enormously great compared with the cross section of the path of the current through the rails. As a matter of practice it is found that where the rails alone are used for the return of current, frequently a considerable portion of the total current actually leaks from rails through ground.

From the above considerations it will be seen that the leaking of current from the rails of electric railways, producing stray currents through ground and on underground piping, does not constitute a source of loss to the railway company, as for instance would be the case with leakage of gas or water. On the contrary, by allowing the current to return by ground and underground pipes as well as by way of the rails, the total conductivity of the return circuit is increased, and the voltage loss in the return of this current is decreased, so that there is an actual saving of power for railway company.

(To be Continued.)

PROCEEDINGS, EIGHTH ANNUAL MEETING, IOWA DISTRICT GAS ASSOCIATION.

HELD AT LINCOLN, NEB., MAY 22 TO 24, 1912.

FIRST DAY—MORNING SESSION.

The meeting was called to order by the President, Mr. G. W. Clabaugh. The following members were in attendance:

ROLL CALL.

Asendorf, C.	Hutchinson, W. P.	Potter, J. L.
Adams, B. C.	Haff, H. G.	Phillips, R. E.
Alexander, A.	Hoskins, H. A.	Roper, G.
Borden, A. W.	Hansen, C	Runner, R. K.
Bertke, W. J.	Harbison, C.	Rice, T.
Blackwell, H. C.	Hulswit, W. H.	Robinson, W. B.
Bowman, W. G.	Kellogg, L. L.	Ross, W. S. S.
Clabaugh, G. W.	Kellum, B. J.	Rooke, T. E.
Clabaugh, A.	Kidder, F. A.	Schall, H. B.
Cressler, G. A.	Leakey, N. G.	Smyley, A. L.
Clark, J. C.	Lamb, G. F.	Steinmuller, E. W.
Countryman, J. A.	Lyon, W. H.	Smith, J. P.
Carson, H. A.	Lucena, J.	Smith, C.
Davis, W. E.	Lockwood, C. W.	Shuff, J. E.
Donelan, J. J.	Leavenworth, M.	Swan, G L.
Daum, H. A.	Lambert, E. F.	Strain, J. R.
Dunkle, C. C.	Laehr, M.	Smith, G. E.
English, A. L.	McLean, G.	Tenney, C. I.
Eustace, E. W.	Mettler, L. B.	Tenney, D. C.
Elwell, G. R.	Maple, F.	Umstead, E. S.
Fair, C. W.	Martin, E. H.	Vincent, C. I.
Forbes, J. W.	Clark, H. F.	Fritsch, C.
Grant, T. E.	Myers, J. A.	Walker, E. M.
Grey, J. C.	Merritt, W. H.	Warnick, J. H.
Griffin, H. L.	Montgomery, G. H.	Weisgerber, E. C.
Griffin, J. A.	Pratt, E. G.	Winchell, S. A.
Guitteau, W. S.	Potter, H. W.	West, W. D.
Houck, O.	Parker, J. F.	Yendell, W. R.
Hensinger, C. R.	Parker, R. M.	Zahm, A. W.

The President—It gives me great pleasure to welcome you to the Eighth Annual Meeting of the Iowa District Gas Association, and as your President I am particularly gratified to see so large an assembly. The regular order calls for the reading of the minutes of the last meeting. [On motion of Mr. Walker, these were dispensed with.]

MAYOR PRATT'S WELCOME.

The President—Before coming to Lincoln we all knew the place, because it was named for the great emancipator; consequently Lincoln, Neb., has a place in the history of these United States that probably no other one has. We knew we would be warmly received here, as it is most gratifying to further know we will also be welcomed by the highest of the city authorities—one of its strong arms. It gives me much pleasure to present to you the Hon. Thomas Pratt, Acting Mayor of Lincoln.

The Mayor—Mr Chairman and Gentlemen: When Mr. Adams asked me to give you an address of welcome, in the office of the Mayor the other day, I asked him how long I would have to talk. He said half an hour. I replied for a fellow who is used to talking about a minute, a half hour seems an awfully long time. The city welcomes you, gentlemen. Have good time and enjoy yourselves. Being here for educational purposes, naturally you have selected the educational center of the United States. When a man gets to the place where he can't be taught anything more, he has reached that point where he is likely to stop breathing, and perhaps be asphyxiated. Education used to be undertaken for the purpose of enabling a man to manage others; but now it is employed for the sole purpose of enabling him to manage himself; and we are glad of it. The other day a gentleman said to me, "Are you going to talk before that gas outfit?" I said I was going to say a word or two. "Well," he said, "I wouldn't want to go to the place to which those fellows will go!" Remarking I would tell you what I thought about that, I followed it up by telling him this story: Three Irish girls came to this country many years ago, and in the course of events they got married. The husband of one died, and she had to wash for a living; the other two went to Oklahoma and struck oil. They became immensely wealthy and built beautiful palatial residences, equal to those on Fifth avenue in New York. Time ran along, and they met one day in a large department store in Chicago. One said to the other:

"Mrs. Mulrooney, where did you spend the summer?"

"Oh, I was at the Catskills. I have a beautiful place there; but they let the colored servants all go and took on those Irish servant girls. How I despise the Irish; I just can't be where they are! Where did you spend the summer, Mrs. Maloney?"

"Well, I was at Saratoga. The colored servants at the hotel went on strike, and they got the like kind of Irish girls. You know they are the most abominable creatures—I just can't endure them around!" Here the third one (the scrub woman), who overheard the conversation, tapped one of them on the shoulder, saying: "Yees can both go to hell; there is no Irish there!" So that is my feeling with regard to the gas people; they are going to a good place; they are a necessity. We are glad to have you here. Enjoy yourselves to the fullest and come back to us again.

THE PRESIDENT'S RESPONSE.

Mayor Pratt, on behalf of the Iowa District Gas Association, it gives me very great pleasure to accept your most kind welcome to this, your beautiful city, and I feel assured we shall carry away with us none but the sweetest memories of our visit with you. And you, too, and all your municipality, will have learned something of the gas men. You will see that they are honest and fair, open, aboveboard and square, always and ever ready to stand in with our copartners, the municipalities; because, gentlemen, unquestionably we are as much public servants as are the Mayor and the Council of any city. We have the interests of our patrons at heart. We are not philanthropists. Don't misunderstand me at all; but it is a good business, and we consider ourselves good business men. We know it is to our interest to serve the public in the best possible manner. We know it is right and best to take the public servants of the municipality—the Mayor and Council—by the hand and let them into our secrets, if we have any. Thank God, we haven't; but if we should have, we are only too glad to take them into everything that is being done by public utility corporations. We are open and above board, willing that everybody should know just exactly where we stand; and when we have convinced the Mayor and Councils of our different cities of that, we will be on the road to prosperity—not only the companies, but the cities themselves.

Mr. Pratt said one of his friends asked him if he was going to talk to this crowd and how he would manage it. Gentlemen, they don't have to manage us; we co operate; we work together. Let us forget the word "Manage." It is not a question of managing; rather it is a question of what is good business. Sometimes, unfortunately, you will meet a man who will say the price of gas is too high. Asking him why, he will say, "Because it is; a good business man said so." "But does that business man know anything whatever about the gas business?" "No; but he is a good business man." Let the good business men find out something about the gas business; then I feel assured that no question will ever arise between them to make them want to do anything that the gas companies have not been willing

and wanted to do for the benefit of themselves and the city. I cannot emphasize this too strongly, gentlemen, that we, being public servants, and copartners with the city authorities, should work and pull together—not pull apart, but together—for the upbuilding of the city. If that rule is adopted, you will find this most beautiful city of Lincoln, the capital of the greatest State in this country, a city that will be looked upon as ideal in its government and in its working with—not managing—corporations.

[On motion of Mr. Kellogg, a rising vote of thanks was tendered Mayor Pratt.]

The President—Next in order is the

REPORT OF THE COUNCIL,

which the Secretary read as follows:

The Council of the Iowa District Gas Association met in Omaha, Monday, January 29th, 1912, at 2 P.M. The following were in attendance: Messrs. Clabaugh, Parker, Shuff (for Mr. Adams, of Lincoln), Linton, Blackwell, English and Vincent. It was decided to hold the next annual meeting at Lincoln, Neb., on Wednesday, Thursday and Friday, May 22d, 23d and 24th. The following papers were assigned:

"The Prepayment Meter, Its Use and Abuse," by E. C. Weisgerber, Cedar Rapids, Ia.

"Does the Consumers Equipment Inspection Increase Sales of Gas to Existing Consumers," by R. K. Runner, Charles City, Ia.

"Construction and Operation of a Modern Water Gas Works for a Small Town," by R. K. Runner, Charles City, Ia.

"Surface Combustion," by H. C. Blackwell, Davenport, Ia.

"Availability of Ammonia Machines for Small Plants," by G. W. Lockwood, Clinton, Ia.

"Methods of Increasing the Efficiency of Employees," by J. A. Perry, Omaha, Neb.

In addition to the assigned papers and the reports of the standing committees, it was decided to list on the programme a number of topics for discussion, the selection of which was left to the Secretary. Methods of interesting the few remaining non-represented companies in the territory were discussed, and it was decided that, together with the methods heretofore used, a personal letter setting forth the benefits of Association work was to be written by the President to the unaffiliated companies. It was decided to continue the appropriation of $25 per annum to the Practical Class of the American Gas Institute, also to make formal application to the National Commercial Gas Association for affiliation on the same terms as the Iowa Association is now affiliated with the Institute.

Methods of printing the proceedings annually were discussed. The Secretary read some correspondence with a publisher of one of the technical journals on the subject. The Secretary was requested to secure further information and report at the next annual meeting.

Mr. Clabaugh read a letter from Mr. I. C. Copley, President of the American Gas Institute, calling attention to the fact that the term of office of affiliation representative from the Iowa Association to the Institute did not correspond with the fiscal year of the Institute. The Institute year closes November 1st, while the affiliation representative has heretofore been elected to correspond with the term of the other officers of the Iowa Association; that is, for a year ending about June 1st. It was, therefore, decided that Mr. Burt, the affiliation representative, should be continued until November 1st, 1912, and in the future representatlves were to hold office for 1 year beginning November 1st. There being no further business the Council adjourned to meet in Lincoln, Neb., on Tuesday evening, May 21st, 1912.

The Council met at Lincoln May 21st, 1912, at 8 P.M. The following members were in attendance: Messrs. Clabaugh (Chairman) Parker, Adams, Fair, Blackwell, English and Vincent.

Finance Committee appointed as follows: Messrs. Blackwell (Chairman), English and Parker.

Nominating Committee appointed as follows: Messrs. Davis (Chairman), Kellogg and Roper.

Decided to print the "Proceedings" in pamphlet form as per offer of the "Progressive Age."

Applications for membership were approved as follows:

Active.

Carson, H. J.	Hulswit, W. H.	Rooke, T. E.
Countryman, J. A.	Lambert, E. F.	Rice, T.
Derbyshire, H. F.	Merritt, W. H.	Smith, F. G.
Daum, H.A.	Montgomery, G. H.	Umstead, E. S.
Genay, T. B.	Phillips, R. E.	West, W. D.

Associate.

Alexander, A.	Lohr, M.	Redman, R. S.
Grant, T. E.	Neal, G. M.	Robinson, W. B.
Harbison, C.	Ross, W. S. S.	

Transferred.

Grey, J. C.

There being no further business the meeting adjourned.

G. I. VINCENT, Secretary and Treasurer.

[On motion the report was approved.]

ELECTION OF NEW MEMBERS.

On motion of Mr. Parker the Secretary was authorized to cast the ballot of the Association for the names of the new members. [The result was subsequently announced.]

INVITING THE INSPECTORS TO TAKE PART.

On motion of Mr. Kellogg the Gas Inspectors of the various Iowa cities were invited to attend the meetings. The

REPORT OF THE SECRETARY AND TREASURER.

was then read as follows:

In addition to the usual work of the year, your Secretary has given special attention to several matters which is believed will be of unusual interest to the members. There are in the three States covered by this Association, 88 gas companies, excluding the gasoline and acetylene companies in the villages, with which we have only few interests in common. Of these all but 19 are represented in the Association. During the year, however, there have been more changes in ownership and management than during any other year since the formation of the Association, and a number of the new managers have not yet joined the Association, but we will undoubtedly have them with us before another year. To facilitate keeping in touch with the changes in the personnel of the various companies, we prepared a card index in the name of the towns, and these are kept posted with information received from various sources.

The officers of the 19 unaffiliated companies have been written at least two personal letters per year by your Secretary, in addition to the efforts of the membership committee. This has continued for the last 4 years and no replies have ever been received. The effort has been continued, not so much because the Association needs these men, but because they need the Association. It would seem that an effort to let these men know what they are missing, in some way that they could not misunderstand, would be worth the effort. Your Secretary suggests that some time before the next annual meeting, a list of unaffiliated companies be furnished, not to a committee, but to *every active member* of the Association, and that they here and now agree to write at least one persuasive letter to the non-conformists. We believe it is a fairly safe prediction that we will at least receive some replies.

The matter of printing our "Proceedings" has been given some attention. The volume covering our first 6 years was made possible only by the unselfish work of Mr. Thos. Crawford, of Clinton, and by the advertisements of our appliance friends. To publish them every year under these conditions seems out of the question, mostly on account of the difficulty of finding the man who will devote his time and effort to it. Your Secretary has found, by correspondence with one of the technical journals of our industry, that they would publish the proceedings for us in pamphlet form, similar to that of the Indiana Association, for an amount well within the financial possibilities of the Association. This has been approved by the Council, and it now seems we will have our "Proceedings" published and distributed to the members every year while the matter is fresh and useful.

During the year there have been added to the Association 15 Active and 8 Associate members, with 1 transfer from Associate to Active. Nine members have resigned and 4 have been dropped for non-payment. The present membership of the Association is: 2 Honorary, 93 Active and 56 Associate members.

The Treasurer's statement (attached hereto) shows the finances of the Association to be in excellent order. Its summary is as follows:

Cash on hand May 23d, 1911..... ..	$270.48
Received during year.....	441.10
	$711.58
Expended during year.....	535.22
Cash on hand May 22d, 1912.....	$176.36

The unusual expense during the year was due to printing the "Proceedings," the cost of which exceeded the income by $165.22.

Respectfully submitted,

G. I. VINCENT, Secretary and Treasurer.

On motion the reports were accepted and placed on file; as also the Report of Finance Committee.

The President thereupon read his

INAUGURAL ADDRESS.

Since our last meeting in Clinton, Ia., 1 year ago, many interesting Association meetings have been held throughout the country, all of which have dealt with problems of the greatest interest to the gas fraternity, and I feel assured that all active and interested gas men in this Association, having profited much by reading the papers and discussions, are ready to advance much of interest at this meeting.

Purposely we have but few papers to be read here, but we expect that the subjects chosen will be of such interest to every one that a full discussion will be brought out. It is hoped that everyone will take active part in this meeting, so that all can get the benefit derived from an exchange of ideas.

In the past year much agitation for lower rates for gas by the municipalities has confronted us, and it, therefore, behooves us to get our house in order that, in presenting our side to the powers that be, we can show conclusively that gas companies are, and always have been, the first to reduce the price of service to patrons whenever such a time arises that they can safely do so, for every business man, if at all progressive, endeavors to increase his business to its full capacity, recognizing that it is the volume of his sales, with small profits, and not small sales with excessive profits, upon which his future success must depend. At the same time he must be assured of a fair return upon his investment before making concessions, for every fair-minded man in his community will be willing that he should receive an adequate revenue to reimburse him for his capital expended; otherwise he will go to the wall, neither he nor his patrons being benefited.

The biggest asset in our business is the giving of good service to our customers. No other factor is as important in the gas industry, for if the service is all that it should be, all other elements in a successful business will be conserved, and you will have established a reputation for honesty and integrity in your community which cannot be successfully assailed.

The imaginary earnings attributed to a gas company by the general public are primarily the cause of rate agitation, and unthinking people, not knowing the truth regarding such statements, help make up the agitation against utility corporations. Now, this being so, would it not be well for gas companies to publish statements concerning their business from time to time? We certainly have nothing to hide, and I feel sure, were we more willing to take the public into our confidence, letting them know just what we are doing, our troubles would diminish, and a far better feeling would exist towards the public service corporations. I know of no other business, particularly of so hazardous a nature as ours, that does not make more money on the capital invested than we do, but as long as we are unwilling to let the public know just what we are doing, they will necessarily imagine we have an octopus that, coining wealth untold, should be suppressed.

In making up the costs of any manufacturing business so many things enter therein that some of our smaller works are often fooling themselves, until a time arises when they find that, having sold gas at a loss for years, are on the verge of bankruptcy. One serious accident will often offset the profits of a small company for many years. The hiring of one additional man about the works will (according to the output) add from 10 to 20 cents per 1,000 cubic feet to the cost of gas. I only call these things to your attention, for I know they are often overlooked in the smaller towns when the question of lowering a rate is contemplated. An old adage that is as true to-day as when first stated is, "Take care of the pennies and the dollars will take care of themselves."

I have dwelt on the foregoing perhaps too much, but you know unrest is in the air, and it is absolutely necessary that, being forewarned, we should be forearmed to meet any assault that may be made upon us. In my judgment this can only be done by letting the public into our confidence, as before stated.

All of our operating costs will be greatly increased in this year, owing to the advance in the price of the crude material that enters into the manufacture of gas, particularly the cost of oil. Wages have largely increased all over the coun ry, and we will have to bear our proportion, so that a statement of costs for 1911 will be no criterion for the costs of 1912.

In our Association we have been most fortunate in the past year, as but few members have withdrawn, and none have been lost to that grim messenger death, so we can congratulate ourselves upon our stability and strength; but let us, in the years to come, so work that we may be a large factor in shaping a business that we have chosen, so that a changed and better feeling may exist in the minds of the public (our patrons), and they, co-operating with the us, thus building up an industry throughout our country that will benefit all. This can be done if we have as our motto, "Honesty and integrity, coupled with justice to all."

COMMITTEE ON PRESIDENT'S ADDRESS.

The Chairman—You have heard the very able and timely address of our President. I will appoint, as a committee to consider the same, Messrs. George McLean, L. L. Kellogg and B. C. Adams.

The President (resuming the chair) called for the

REPORT OF THE COMMITTEE ON NOMINATIONS,

which was read by Chairman Davis as follows:

As Chairman of your Committee, I beg to report the following, to be placed in nomination for the various offices of this Association during the ensuing year:

For President—Mr. C. W. Fair.
For First Vice-President—Mr. B. C. Adams.
For Second Vice-President—Mr. H. C. Blackwell.
For Secretary and Treasurer—Mr. G. I. Vincent.
For Members of Council—Messrs. J. C. Gray, Frank Maple, A. W. Borden and E. M. Walker.

ELECTION OF OFFICERS.

On motion of Mr. Potter, the recommendation was accepted and the Secretary was instructed to cast the ballot for those named. The Secretary cast the ballot of the Association for the nominees, with the exception of the Secretary, the ballot for whom was cast by the President.

A RESPONSE OR TWO.

The President—The newly-elected officers should have something to say for themselves. It gives me much pleasure to call upon Mr. Fair, our President-Elect.

Mr. Fair—Mr. President and Gentlemen: If you will recall the names of the gentlemen who have filled the office to which you have just elected me, from Kellogg to Clabaugh, you will realize the honor you have done me. I appreciate this, and shall do everything in my power to continue the good work of this Association. Believe me when I say that I thank you, one and all.

The President—The old adage that the last shall be first and the first last has changed to-day. We know that Adam was the first man, but he is the last man in this Presidential succession—Mr. Adams.

Mr. Adams—I hope you gentlemen all realize how welcome you are here. I want you to roam around without feeling any restraint. It is a bit early for me to talk, but let me say I thoroughly appreciate my election as your Vice-President. I think our Association is the best of its kind in the country. We are not standing still; we are going ahead. That is the real essence of the whole proposition. We have a bunch of live men, who know how to talk, act, and manage their corporations. The gas companies in this section are getting along well, and Mr. Clabaugh in his address voiced the sentiment of every gas man in this part of the country.

The President—I am sure this would not be complete without hearing from Mr. Blackwell, our Second Vice-President.

Mr. Blackwell—Mr. President and Gentlemen: I have two mighty good "bosses" here, and if there is anything that I can do to help them carry on the work, that has been done by the best Association in the United States, I will do my utmost. I know exactly what Mr. Fair is up against, for I have just gotten through with a similar job in the Iowa Electrical Association. It is no "snap" to be President; but the Second Vice-President has a cinch. I thank you very much, gentlemen, for the opportunity you have given me of serving you.

The President—Is there any other general business to come before the meeting?

A TELEGRAM.

The Secretary—This telegram, from Mr. Philmer Eves, Secretary of the Indiana Association, is at hand:

"Directors of Indiana Gas Association in meeting assembled send greetings to the Iowa District Gas Association with best wishes for a good time at your eighth annual meeting."

OBITUARY MENTION : MR. J. B. HOWARD.

Mr. Parker—Gentlemen, Jeremiah B. Howard, familiarly and affectionately known to all members of this Association as "Uncle Jerry," died at his home in Galena, Ills., April 10th, 1912. Those of us who attended the last convention at Clinton, will always remember the genial countenance of Uncle Jerry, and the interest he took in our profession and in ourselves personally. He was a past master in the art - the dean of the Association in every respect; so I think it fitting that our Association at this time takes some action respecting the memory of a man, who has been active in the profession for the last 50 years. I remember his speech at our dinner in Clinton, when he said he would not be with us very long; but that when he did go he hoped to rest in the soil of Iowa. So, on behalf of the Iowa Association, I move a committee be appointed to draw up suitable resolutions, and I will ask you not to put me on that committee as Chairman, because there are others who knew the incidents of Mr. Howard's life far better than I do, and were better acquainted with him and his work.

Mr. Roper—I think I can say that, with the exception of one or two, I knew "Uncle Jerry" probably as intimately as anybody here, and for as long or a longer time. I have known "Uncle Jerry" for nearly 22 years. The last meeting that he attended (that of the Illinois Gas Association in Chicago) was only a few days before his death, and then he was the same light-hearted, genial "Uncle Jerry" that he had always been. I don't think the Iowa District Gas Association could do any less than pass resolutions in sympathy for his family; and I heartily second the motion.

The President—You have heard the motion, which is most commendable; because we all loved "Uncle Jerry." I knew him for many years—not intimately, but as one of the old landmarks—a man who extended the hand of fellowship, and who received you as a brother. Nothing more beautiful may be said of a man. If there is no objection, it will afford me satisfaction to appoint Mr. George McLean (Chairman), and Mr. Roper and Mr. Parker a committee to prepare resolutions to go on our minutes; and I trust a copy of them will be sent to the family left to mourn him.

ABOUT THE MEETING TIME.

Mr. Blackwell—I don't know how many of those present feel as I do about the date on which we hold our meetings. About this time of year the gas and electric men are doing a great deal of new business work; and the representative from the smaller plant, for which this institution does more than any one else, is the man who wants to be on the job right now. A one-man or two-man plant cannot send all its men legitimately to a convention at this time of the year. I would like to ask if it might not be in order at the present time to have suggestions regarding a time for holding the meetings that would not interfere with business as much as the present arrangement. The appliance men are busy at this time of year; at any rate it is that way in the electric light business. Many would, I think, prefer to come a little earlier or somewhat later; and would ask, Mr. President, that you put it to the incoming Council, to decide on a date that might be more convenient. I believe it would be preferable to have the date earlier rather than later. Probably the month of March would be a good one for all frozen-up men, and I believe meetings are about as warm as any place to which we could go.

The President - I think it important we take time to discuss this question, for there will be pros and cons, unquestionably. It is quite a hard task to have the meeting held at a time to suit everybody, but our object would certainly be to choose a time which will suit the majority, for I believe the majority rules.

Mr. Tenney—While Mr. Blackwell was speaking I thought of a remark made by Col. Roper at Clinton last year. He said a man could accomplish 12 hours' work in 6 hours, but he couldn't do 6 hours' work in 12. As for myself, I always look forward to this time in May or June as one of the great blessings. It is an excellent thing for us to get away from the rush of business that comes to us during April and May, and have the few days' rest which we get on occasions like this. It would seem an appropriate time for appliance men to meet others on the firing line and introduce their appliances. I am very much opposed to any change in the date.

The President—I know that there has been some objection from a number of our members to having the meeting just at this time, owing to the natural gas meeting in Kansas City. One week earlier would obviate that interference, and we would have a larger attendance if it could be done. Whether that week is early enough to suit all I don't know.

Mr. Tenney—If the Iowa Association meeting was held a week earlier, it would conflict with the Wisconsin Association date, which is approximately the 16th and 17th every year.

Mr. Kellogg—I haven't heard all this discussion, but it seems to me it would be a good thing to appoint a committee to confer with the other Associations and have our dates fixed as they do with fairs, making it certain that they won't conflict with each other. It occurs te me a joint committee of our Association, the Wisconsin Association and the Natural Gas Association could confer and arrange dates.

Mr. Roper—From the appliance point of view I don't think we need worry. The average appliance man is through with his business by this time of year: if not, he should be; so it is only a question of which Association he wants to attend. If he comes here and does any business, he will do more than I ever did in any convention that I ever went to. So I would suggest that you pay no attention to the appliance men in fixing your date, and the most successful meeting will be the one they will attend.

The President—It is now in the hands of the Council, so there is no need for a motion. I think Mr. Roper hit the key-note. Let us not ask anything of any other Association in the country. I believe we can hold our men, no matter what happens. However, the question will be taken up by the Council, which body will come to some definite conclusion.

At the request of Mr. Geo. D. Roper Mr. W. R. Goodell (Aurora, Ills.) addressed the Convention in behalf of the National Citizens' League, and the Secretary read letters, respectively, from Mr. E. E. Egan, Secretary and Treasurer, Burlington (Ia.) Exchange, and Mayor Frank C. Thornton, same city, cordially and unconditionally inviting the Association to hold its 1913 Convention in the named city.

The President—If there is nothing more under the head of General Business, we will proceed with our programme.

The following

REPORT FROM COMMITTEE ON NEW BUSINESS

was read as follows by Chairman Gray:

Your committee, appointed to prepare a report on the "Progress of New Business During the Past Year," begs to report as follows:

In spite of the general business depression all gas companies made substantial increases during 1911. Appliance sales of 1910 were greater than ever before, and the consumption from same helped out materially. In 1911, the appliance sales, while not quite up to the 1910, were nearly so, and we look for good increases in gas sales during the coming year.

Few changes in business methods have been made, with the exception of a more liberal policy in credits. This change has been taken up by a great many companies aiming to inspire confidence in their consumers. This, to a certain point, is good policy, but should be checked closely to insure good results.

Campaigns on small appliances, such as Reflex lights, gas irons, gas heaters, etc., have made phenomenal success in nearly every instance in which they have been tried. This, of course, merely proves that if we concentrate our efforts along any one line of sales we are bound to show good results. While these compaigns are of great benefit to the gas companies, we should not specialize to any great extent, unless we employ extra men for just this sort of work, as our sales in other lines will fall short if all our efforts are devoted to any one particular line.

The National Commercial Gas Association is doing and starting work along lines that are sure to benefit the gas companies at large. They are still publishing a monthly "Bulletin," which is of great help to the gas man, and should be before every progressive man interested in this work. They are promoting a liberal advertising campaign to be subscribed for by all gas companies at a total expense of one mill per 1,000 cubic feet of gas sold. Our electric competitors have long flooded the press with good advertising, which has brought them results; and the gas industry should have followed in their footsteps long ere this. A course in salesmanship has been started. Committees have been appointed in different lines of work. Company sections are flourishing, and many other features are promised in the near future. Summing up the entire year, we consider that the gas business at large has made forward strides and the end is not yet.

J. C. GRAY,
S. A. WINCHELL,
A. CLABAUGH,
} Committee.

Discussion.

Mr. Adams—Could this new business committee tell us what per cent. of the population is using gas in the cities represented in this Association; and what are the sales per capita? That is the essence of this new business work. We know that progress is being made; but how great?

Mr. Gray—We haven't gone into any such detail as that, but possibly our Vice-President might suggest that work for the coming year and have those statistics compiled.

Mr. Walker—About a year ago I tabulated from "Brown's Directory" the number of gas ranges in use in Iowa, and found there were approximately 45,000, or one gas range for every 50 people.

Mr. Adams—Two small companies in this State have one consumer for every eight in population. I know of other towns about the same size that have one consumer for every 20 or 30 in population.

Mr. Vincent—Mr. Walker spoke about data taken from "Brown's Directory." I imagine Mr. Brown has about equal difficulty in getting data as our Membership Committee had in getting replies, so possibly the information is not complete. I think the sales per capita might be fairly accurate; but sometimes even those they may have to estimate.

Mr. Zahm—In the Electrical Association we have what is known as the "Facts and Factors Committee." As Secretary of that Association I have had more applications from parties outside of the State for that one report than for any other made before our Association. It is the most interesting one that we have. I think it would be a fine thing for your Association to appoint a similar committee and obtain data for the gas companies. They send out a blank sheet showing how to arrive at percentages. As no names are signed, there isn't anything public. The committee makes its reports from the unsigned statistics, and even the Chairman of the Committee has no means of tracing the identity of any particular report. Even then there isn't anything that would not stand inspection.

Mr. Vincent—How would Mr. Zahm go about getting replies from some of the smaller companies on such a proposition.

Mr. Zahm—They cannot obtain them from all companies. This year we fell down, although last year we had most interesting reports. Possibly we started too late this year.

The President—I think Mr. Zahm's suggestion is a good one, and hope the incoming administration will take it to heart.

[On motion of Mr. Adams, duly seconded, the report was accepted.]

The President—We will now have from Chairman Bertke the

REPORT OF THE COMMITTEE ON CONSTRUCTION.

Your Committee on Construction has the following to offer: Owing to change in our membership, coming at such a late day, it was impossible for us to do any work whatever; and our report, therefore, cannot be an extensive one.

An item of interest in gas works construction at the present time is the increased use of reinforced concrete in place of brick and steel. It is interesting to note that some of the largest gasholder tanks built in this country are of reinforced concrete. The difficulties encountered in building a 10 million cubic foot holder tank seems to have been solved by the use of this form of construction.

Some valuable information has also been obtained in the past few years on the operation of vertical retorts in the manufacture of coal gas. The fact that, with vertical retorts, the cost of labor has been reduced so as to compare favorably with the labor cost in water gas manufacture, in addition to an improvement in the general results compared with horizontal retorts, will make it possible to make both coal and water gas in our plants where gas coal is available and thus reduce the holder cost. Complete reports on the operation of vertical retorts can be found in the "Proceedings" of the American Gas Institute.

A new water gas scrubber, also developed in the past few years, is in successful operation in Detroit. For more information on this subject we will again refer you to the "Proceedings" of the American Gas Institute.

Attention has also been given, in the past few years, to an improved boiler furnace design, increasing the capacity and efficiency of such and eliminating smoke. These improved furnaces are now being installed, and it is unfortunate that the time has not been available for your committee to obtain information and data on the operation of these furnaces.

Automatic water weighers have been developed and installed in several plants. Your Committee has no information as to how reliable and accurate the different types have proved; but if they are a practical success we can with them obtain the necessary information in our works to help improve the efficiencies of our boilers and engines.

While nothing startling has developed during the last year in the construction of gas works and its appliances, there has been a general trend towards a more scientific operation of gas plants, due to the more general use of the special appliances, such as the air meter, steam meter and pyrometer, adopted for the use of gas makers and no doubt the future will show the same development that the past few years have shown. Respectfully submitted,

WM. J. BERTKE.

An adjournment was ordered, to terminate at 2 P.M.

FIRST DAY—AFTERNOON SESSION.

The President called for the

REPORT OF THE COMMITTEE ON MANUFACTURES,

which was read by Mr. Weisgerber, as follows:

In the past year there have been no very astounding changes or improvements in this department; but still, all-in-all, there have been a large number of most interesting and profitable experiments, all of which are steps forward. In years gone by this department of the gas business was always considered the financial barometer of a gas company, and though this old standing has been somewhat discounted in the past few years, still if manufacturing results are poor, thus making high cost per 1,000, no matter how good and well managed the other departments may be, the earnings of the company are greatly decreased, especially at this day. There is a wave going across the country, agitated especially by petty politicians and so called experts, for cheaper gas.

Cases of this kind have been, and are, fought all the time, and after a decision is reached the first department which needs a most thorough looking into is the manufacturing. A thorough study must be made in order to see if we cannot manufacture our products cheaper and still keep up the quality. All the branches, such as generating, condensing, washing, scrubbing, purifying, etc., are thoroughly looked into and every endeavor made to reduce our operating expenses; new wrinkles, are tried along with experiments for better results, all of which will bring this result. In the past year a number of very good papers were read, all of which ought to and will help; and as a few we quote, "Carbonization, Heavy Charge in Horizontals and Inclines," by Ernest Astbury, District Junior Gas Association, Manchester, England. "Some Principles of Condensation, with Especial Reference to Water Gas," by Mr. L. E. Worthing, American Gas Institute; St. Louis, Mo. In this paper the author briefly outlines the methods of condensation practiced by various engineers in coal and water gas works, having in view the elimination of naphthaline and tar in the former, and, in the latter, the obtaining of the highest oil efficiency with the removal of the tar. He reaches the conclusion that, with especial reference to water gas, the process of condensation is governed by the principles of Dalton's and Regnault's law of vapor tension. These principles were enunciated in Mr. Earnshaw's paper read before the Third Annual Meeting, American Gas Institute, on "Benzol Enrichment." Briefly summed up, it amounts to this:

As water gas is cooled from the superheater outlet, those components of lowest vapor tension will condense out of the gas more or less saturated with components of higher vapor tension, but the components of higher tension are micsible in all proportions with the liquids already condensed, having lower vapor tensions. Therefore, Regnault's second law comes into operation—*i. e.*, when two liquids are miscible in all proportions, the vapor tension of the mixed liquid is intermediate between the tensions of the separate liquids. On this basis the author reasons that, where a slow condensing method is used—that is, where the time of contact between the gas and condensate is long, as is ordinarily the case in water gas operation—a great amount of benzol is absorbed by the condensate and the candle power of the gas is greatly diminished. He presents some very startling observations in the way of oil economies from tests with a washer-cooler, designed to condense the gas very rapidly, and, in the same way, free it of its contents, so as to shorten the element of time contact between the gas and condensate. The results seem to indicate vast possibilities for increase in efficiency in this branch of water gas manufacturing.

"Increasing the Efficiency of a Water Gas Plant," by J. S. Haug, Canadian Gas Association, Quebec (Can.) meeting, the writer dis-

(*Continued on page* 106.)

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NEW YORK, MONDAY, AUGUST 12, 1912.

BRIEFLY TOLD.

ILLUMINATION AT THE OPTICAL CONVENTION IN LONDON.—A "London Correspondent" thus writes respecting the subject in hand: During the month of June the "Optical Convention" was held in London, being opened by the President, Prof. Silvanus Thompson, on June 19. The convention seems to have been largely devoted to optical instruments and apparatus, but this year a considerable amount of attention was given to lighting. A special section of the exhibits was given up to illumination and photometry, and a number of well known electrical firms showed lamps and apparatus. The "Illuminating Engineer" (London) commenting on the display, points out that it is a somewhat new feature for gas and electric lighting exhibits to be shown side-by-side in this way; but the most striking thing about the exhibition was the interest shown in scientific methods of light-measurement and the application of such measurements to the design of globes, shades and reflectors. The most notable feature adopted by a number of firms was the display of new forms of fixtures, and side-by-side with them charts showing the polar curves of light distribution from the units. This principle was followed throughout in the holophane exhibit, Messrs. Sugg & Co., Messrs. Keith & Blackman, and other firms dealing with gas lamps applied to their new high pressure and low pressure units. A few years ago it would have been impossible to secure a polar curve for any of these units; but now they are presented as a matter of course, and companies are also paying much closer attention to the design of globes and reflectors. At one time people were content to use a lamp as it stood and to make the best of the particular distribution of light which the mantle, arc or electric incandescent lamp happened to give. With each form of lamp many varieties of reflectors are being supplied, some being intended to concentrate the light downwards, others to concentrate the light on the shop window, etc. Yet another point that is greatly appreciated by modern firms dealing with lighting appliances, is the value of photographs of good installations taken by artificial light. Such photographs are taken with the object of showing the conditions of illumination as they actually are, and bringing out the positions and nature of the lamps and fixtures, It is by no means an easy matter to do this; and many of the photographs taken by artificial light have the defect that the lamps themselves are more or less lost in "halation," An excellent series of photographs, free from this defect, was shown by "Holphane, Ltd.," and it was explained that success in this direction was obtained largely by the care taken in giving exactly the right exposure. The time of exposure can be gauged very accurately by photometric measurements of the various objects to be photographed, and this is done by means of the little "holophane lumeter" instrument, Most of the firms showing lighting apparatus also showed photometric instruments. For example, Sugg and Company showed an entirely new form of "radial photometer" for getting polar curves, and mentioned that the curves shown at the exhibition were obtained by means of their apparatus. In the holophane exhibit there was also a new instrument for use with the holophane lumeter in obtaining polar curves, the following advantages being claimed:

(1) It is very quickly used; (2), the polar curve is worked out while the experiment is in progress; (3), the apparatus, being portable, can be moved from room-to-room; (4), stray light can be allowed for; (5), but one observer only is required. Yet another new arrangement for getting distribution curves was shown by the South Metropolitan Gas Company, while Messrs. Wright & Co., showed a new form of illumination-photometer. These exhibits are mentioned to show how keenly the scientific side of illumination is now being taken up in England and how much stress is laid on the measurement of light. Recent advances in this direction also formed the subject of a paper by J. S. Dow and V. H. Mackinney, who showed quite a variety of new apparatus. Some very striking new applications of photometry were mentioned. Besides being widely used for determinations of the light in schools, libraries, factories, etc., there are some unexpected purposes for which such instruments can be applied. For example the holophane lumeter instrument has been used to estimate the reflecting power of wallpapers and the absorption of glasses, globes and solutions, and for such purposes is valuable to those engaged in the optical industry. A case is even mentioned of the instrument having been used to test coal, the reflecting power of various samples being studied as an index to their purity. The value of photometric measurements in taking photographs has already been mentioned. A photometric measurement only takes a few seconds, and can be applied when an actinometer would not answer. Moreover, it enables the operator to base his exposure on a study of the *actual brightness* of the objects to be photographed, and thus takes into account the local conditions of brightness and shadow, whereas an actinometer only gives a general measurement of the light. An account was also given of some measurements of daylight and natural phenomena. It is suggested that the instrument could be used for meteorological observations of daylight and of the night-sky (about 0.01 foot-candles). In the same way comets and stars might be studied. The authors gave an interesting curve showing how the illumination and temperature varied during the solar eclipse of April 17th, during the present year. It was curious to notice that the reduction in illumination at "totality" was exactly proportional to the area of the sun's disk obscured. Another new form of apparatus described was a "portable standard of light," which consisted of a small tungsten lamp fed from an accumulator, an ingenious device being introduced to maintain the voltage of the latter constant. In conclusion the authors advocated the use of simpler and more convenient and up-to-date methods of photometry at technical colleges. Students at present waste too much time on antiquated apparatus and burdensome calculations, and it would be much better if more attention were devoted to the practical applications of the measurements of light and illumination. Education in the science of optics and illumination was also referred to in the inaugural address of the President, who pointed out that no University in England had yet organized a Chair of Optics.

FACTORY LIGHTING IN GREAT BRITAIN.—A London correspondent reports that considerable attention has been attracted by the most recently issued Report of the Chief Inspector of factories in Great Britain, which makes special reference to the subject of factory lighting. During the last few years the authorities have been pursuing the study of illumination, and the last report contains a special presenting by Mr. D. R. Wilson, covering no less than 38 pages. Commenting on this "The Illuminating Engineer" remarks that at least 12 per cent. of the space in the entire report is more or less occupied with lighting matters, and about 2,500 measurements in various factories have been made. These tests were mainly carried out in cotton and linen spinning, weaving and other factories, printing works, etc. It is suggested that the chief requirements are: (1), That the illumination should be adequate, (2), "Glare" effects should be absent; and (3), No troublesome shadows must be caused by the work. Mr. Wilson and other inspectors remark that the flat-flame burner is be-

ing gradually replaced by inverted incandescent mantles in England and particular headway has been made by high pressure gas lighting. The commonest defect met with is the use of unshaded lamps which inevitably give rise to glare. This was frequent in the composing rooms of printing works. A number of diagrams are given showing how beneficial it is to use appropriate shades with these lamps, both with a view to protecting the eyes of workers from their brilliancy and in order to increase the illumination on the material. An interesting point raised by the report is the importance of providing an extra strength of illumination in the case of dark materials. There are also special problems such as the precision of illumination for sewing machines where shadows are particularly objectionable. One method which is illustrated and recommended by the inspector takes the form of using very small, local, screened lights, attached to the frame of the machine and throwing a strong illumination on the needle. As regards the actual amount of illumination required for different trades no attempt to lay down a standard has been made as yet. A great deal of the evidence bears on the lighting of iron foundries where the dark surroundings give particular trouble. Attempts were made to ascertain how far a direct connection could be traced between poor illumination and accidents, but it would probably require a more extensive investigation to enable this matter to be settled. An interesting announcement in the report is that the British Government have resolved to appoint a special Departmental Committee to enquire into industrial lighting. It appears that a committee of this kind has already been established in France, and is contemplated by other countries.

SOMETHING FROM PORTLAND, ORE.—The name Portland Gas and Coke Company is somewhat out of date; in fact, it serves only as a reminder of the days when the Company manufactured coal gas. Due to the high price of coal, carbureted water gas displaced coal gas, and shortly after Mr. Hilmar Papst became General Manager he installed machinery for the manufacture of oil gas, made from California crude oil only. A large quantity of lampblack is made in this gas process, which, after being dehydrated, is compressed into carbon briquettes, for which there is now a ready market, as they burn very readily and contain but a very small amount of ashes. Portland Gas and Carbon Company would, therefore seem more appropriate than the present title. The existing gas plant is located along the Willamette river, near the heart of the city, where ground is now very valuable. A few years ago Mr. C. F. Adams, Chairman of the Board of Directors, forseeing the advisability of purchasing a suitable property in a better location, purchased a large tract of ground some distance below the city, in the suburbs of Linnton, along the Willamette river, near its confluence with the Columbia river. As the property was low, and to avoid any danger of floods, which are of yearly occurrence, the level was raised by hydraulic dredging for an average height of nearly 20 feet. This fill is now completed and work on the foundations has been started. Portland has grown tremendously during the last few years, and, due to the energetic management, the annual gas sales have jumped by leaps and bounds. As the climate is comparatively mild during the winter months, gas is, therefore, the best and most economical fuel for heating residences and offices. In fact, there were many days last winter when the sendout was far in excess of 5 millions cubic feet. The new buildings (of concrete) are being made large enough for a daily make of 15,000,000 cubic feet, and the oil gas will be made in 20 feet diameter, oil gas generating sets, which, in addition to the required washers, scrubbers, naphthaline and tar extractors, purifiers, etc., are being furnished by the Gas Machinery Co., the Northwest Gas Equipment Company, Portland, Ore., Sales Agents. Portland is known for its pure gas supply, notwithstanding the fact that the crude oil contains from 1 to 3 per cent. of sulphur. The gas, before purification, contains large amounts of sulphureted hydrogen and carbon bisulphide; after the former is removed, by the usual iron sponge purification, the gas is passed through a reheating apparatus, where about four-fifths of the organic sulphur is converted into sulphureted hydrogen, which is removed by secondary iron sponge purification. This method provides a very pure gas at only a nominal additional cost; and, although large quantities may be burned in open heaters, no smell of sulphur will be detected in ths rooms, nor will the windows show the white tint so commonly noticed where impure gas is burned. This reheating process (patented by the Gas Company's Engineer) Mr. E. L. Hall) will, of course, also be used in the new plant, and the Gas Machinery Company, which has the exclusive right to install this process, is building the 20-foot reheating apparatus. The gas will be pumped through 16-inch pipes, to the distributing holders, by General Electric Co. gas compressors. The gasholders for the new plant are being built by R. D. Wood & Co. Manager Papst and Engineer Hall deserve a great deal of credit for the beautiful design of the buildings, labor saving arrangement of all machinery and apparatus, and quick progress of the work. Gas will be made in the new plant towards the end of this year.—P.

CURRENT MENTION—

WE are informed that Mr. Edgar C. Ross has purchased a controlling interest in the South Delaware Gas Company, from Sydney Kenney, of Philadelphia, at an upset price of $55,000. The plant of this concern is located at Seaford, Del., and it supplies gas to the settlements of Bridgeville, Blades, Laurel and Seaford. It is proposed to extend the distributing system to Federalsburg, Md.

"L. V. R.," writing from Charleston, S. C., under date of the 3d inst, informs us that the proprietors of the Charleston Consolidated Railway and Lighting Company, the Charleston Consolidated Railway, Gas and Electric Company and the Charleston Edison Light and Power Company have filed a bill of complaint in the Federal Court, with the City Council of Charleston, as the defendants. The 21st inst. was fixed as the date for a motion to be made for an interlocutory writ of injunction restraining and enjoining the city from enforcing the new rate ordinances while the case is pending. It is alleged in the complaint that the new gas rates, now in force, do not give an adequate return to the Company on its investment here in its electric light and power plant and equipment. The gross income of the Company during 1910, for electric curren, twas $176,706.65; for 1911 it was $196,131.33; or an average for the 2 years, of $186,419.24. Operating expenses, not taking into account any allowance for depreciation, were: For 1910, $94,662.96; 1911, $114,097.95; average, $104,380.45. The returns for the 2 years maintained under former rates, without depreciation allowance, were: 1910, $82,043,69; 1911, $82.033.88; average, $82,038.79. This return on property, valuated at $933,517, amounts to 8.79 per cent. as an average, which percentage will be greatly reduced when depreciation is taken into the account. The rates ordered by City Council it is alleged are from 19 per cent. to 23 per cent. lower than those suggested by its own expert, Mr. Lynden. Further, it is pointed out that the Company has just expended $450,000 in order to enable it to work at all economically. If the new rates had applied to the gross business of 1910 and 1911, it is claimed by the complaint, the percentage of return would be cut down from 8.79 to 1.65 per cent. for 1910 and 1.56 for 1911. The population of Charleston, it is claimed, is increasing very slowly, and no benefit from expanded business under the low rates is possible. The storm hazard of the Company is great, which is also a consideration in making new rates. In closing, the complainant alleges that the present rates are in violation of the United States Constitution, inasmuch as they endanger property and do not afford the Company protection, as is deserved.

THE output of the Boston (Mass.) Consolidated Gas Company for the month of last July was 15.12 per cent. over that for the corresponding month of 1911. This is the largest increase in sendout (percentage) shown in any month since September, 1907, the September prior to the "Bankers' Panic."

WE understand that Mr. George Matt has sold his controlling interests in the gas and electric lighting plants of Lancaster, O., to the American Gas and Electric Company. This means that the Lancaster gas works will be reconstructed; a fact that will certainly redound to its credit as a money earner.

AT the annual meeting of the Marion (Mass.) Gas Company, Mr. John C. Makepeace, of Wareham, was elected President, and Mr. Benjamin Waters (also of Wareham) was elected Treasurer and Manager. The Company proposes to go on with considerable main extensions, the use of gas for domestic purposes having increased in and about its district.

THE annual report of the Middletown (Conn.) Gas Light Company shows that its work during the year was done at a good living profit. The election resulted in naming the following officers: President, W. H. Burrows; Treasurer and Secretary, H. L. Mansfield.

THE output from the Holyoke (Mass.) municipal gas plant during last July was 18,728,490 cubic feet; July, 1911, the output was 17,219,280 cubic feet.

AT the annual meeting of the Fall River (Mass.) Gas Works Company, the officers elected were: Treasurer, H. B. Sawyer; Clerk, W. T. Crawford: Directors, P. Dexter, A. D. Foster, S. C. Lee, C. F. Prichard, R. Bobb, F. P. Royce, P. Stockton, E. R. Utley and E. S. Webster.

(*Continued from page* 103.)

cusses the progress made in efficiency by replacing the old guesswork methods with the application of scientific principles to his machine. By the installation of air and steam meters he was able to produce uniform fire conditions and uniform results. By installing split runs, handling his steam to the best advantage, aided by the steam meter, he corrected some serious clinker troubles and increased the capacity. A block of concrete, which had been carelessly allowed to fall in the inlet pipe to his relief holder at a previous time while making a repair, caused an extraordinary amount of back pressure. It was dug up and removed. A P. and A. tar extractor was installed, to the great betterment of his purification results. Other changes were necessary, owing to the vast increase in capacity, such as installing a larger relief holder, exhauster and condensers.

"Recent Developments in the Manufacture of Water Gas," by Mr. V. E. Bird, New England Association of Gas Engineers, Boston, Mass. The author presents operating results that show marked increase in fuel efficiency, due apparently to a new method of steam supply. The changes were made on U. G. I. sets, the steam being introduced through 16 steam nozzles arranged in 3 levels throughout the height of the generator. The author presented theoretical calculations to prove that the increase was correct. The discussion brought out various errors in the calculations which seemed to question the apparent increase in efficiency. However, the scheme brought possibilities to light, and the paper from that standpoint alone is worthy.

"Data on Removal of Tar from Water Gas," by Mr. A. P. Beardsley, New England Association of Gas Engineers, Boston, Mass. The author experimented with a system for the extraction of tar according to the following:

"The gas, after leaving the superheater, passed through the washbox and board scrubber, condensers, relief holder located on a spur at the outlet of the condensers, a P. and A. tar extractor, two shaving scrubbers in parallel, and then through the purifiers. The relief holder played a very little part in the condensation on account of the way it was connected, receiving only a portion of the gas." The following table is a summary of his observations:

Temperature.	Degs. F.	Lbs. Water Per 1,000.	Lbs. Tar Per 1,0 0.	Per Cent. Tar Removed.
At superheater outlet	1,300	8.03	5.79	none
At board scrubber outlet	160	10.93	4.56	21.3
At outlet of condensers	120 125	....	0.91	80.0
At outlet of P. and A. extractor.	110	....	0.19	96.6
At outlet shaving scrubbers	100	....	0.02	99.7
At outlet purifiers	90	....	none	100 0

Mr. Beardsley discovered that the P. and A. tar extractor operated on 81 per cent. efficiency, as compared to 67 per cent. efficiency when the differential was raised from 2 to 8 inches. The efficiency of the shaving scrubbers was 88 per cent. when operated at their rated capacity of 2,000,000 cubic feet per day, but when overloaded to 3,500,000 cubic feet per day, the efficiency fell off to 53 per cent.

"Tar and Tar Products," by Mr. A. D. Whittaker, American Gas Institute, St. Louis, Mo. This is an excellent paper revealing the development of an end of our business to which, generally speaking, very little attention is paid. The author shows how the Atlanta (Ga.) Gas Light Company established a market for tar and tar residuals. Through good management and business methods, he was able, within a period of 2 years, to increase the credit on his holder cost, from 1.7 cents per 1,000 to 3 cents per 1,000. One can readily figure what this means in dollars and cents on an output of 700 or 800 millions cubic feet annually.

"Notes on the Development of a By-Product Coke Oven Gas Plant," by Mr. Warren S. Blauvelt, American Gas Institute, St. Louis, Mo.

There are a great many other excellent papers, too numerous to mention, all of which will more than help one looking for information and assistance. While the price of gas is going down, the price of coal seems to rise, and, at the same time, returns from our by-products, outside of coke, are also getting less. This itself is a most worthy subject which needs thorough looking into. Time and time the question came up: "Would it pay us to distill our own tar, etc., either as individuals or collectively?" This subject also means that deep research work is most necessary, and it is the firm belief that the time will soon come when the gas associations as a body will appoint a commissioner, or a number of commissioners, made up of thoroughly trained and competent men, to do nothing but research work on these lines and report each year their findings and results of their experiments so that the entire gas fraternities throughout the world will reap the benefits. In Germany, the Mid-Rhine Association (since 1908) has been making tests in the various gas works represented. The regular routine of the examinations covers operation of the benches, including methods of firing; tests of flue gases; temperature in various parts of the bench and leakage in the regenerators; temperatures and methods of condensation; ammonia recovery; and determinations of calorific and illuminating power and specific gravity of the gas. The tests are found to be extraordinarily useful and instructive to the staff in medium sized and small works, and equally so to the firms building the plants and to their engineers and chemists.

In regard to vertical retorts, there has been a most excellent report, made by Carroll Miller, "Progressive Age," March 15, 1911, p. 232, which will doubtless prove very interesting to all who care to read same.

The plant comprises 3 stacks, each containing 6 benches of 10 vertical retorts of the Dessau type. The retorts are 13 feet 2 inches long, 22½ by 9 inches at top, and 27 by 14 inches at bottom, and designed to carbonize 1,100 pounds of coal each in 10 hours. There is one producer for each bench, with grates 3 feet 4 inches by 4 feet. The total depth of the producer, from grate bars to charging door, is 18 feet, but as the gas is taken off about 3 feet above the grate, that figure represents the effective fire depth, the remainder of the height being available for storing coke.

An official test of 7 days was made in December with the following results:

Items.	Weights, etc.
Average weight of charge	1,058 lbs.
Time of charge	10 hrs.
Gas per retort per 24 hours	13,498 cu. ft.
Gas made per lb. of coal	5.39 cu. ft.
Average C. P. No. 7 Bray flat flame burner	12.1
Average calorific value	579.4 B.T.U.
Tar per gross ton of coal	13.17 gals.
Ammonia per gross ton of coal	5.01 lbs.
Bench fuel, dry coke per 100 lbs. coal.	17.0 lbs.
Bench fuel corrected to coal containing 6 per cent. ash and credited with screenings from generator fires	15.83 lbs.

Men Employed in Retort House.

	Day.	Night.	Total.
Charging, discharging and cleaning fires	5	5	10
Foreman	1	1	2
Cleaning take-off pipes and mains	2	—	2
Scurfing retorts.	1	—	1

In the discussion that followed the reading of this paper Mr. Africa, of Manchester, N. H., after briefly describing the Manchester setting, gave results of two tests, one made August, 1910, the other, February, 1911. At the time of the first test there was considerable leakage around the bottom lids; the second test was made after this had been corrected and after installing a retort house governor to control the vacuum. The figures on the two tests are:

Test.	I.	II.
Average yield per retort per day, cubic feet	13,555	12,170
Average coal per charge, lbs	1,022	977
Yield per lb. of coal, cubic feet	4.97	5.28
Candle power, flat flame burner	14.45	14.81
Candle power, No. 2 Met. burner	19.5	19.90
Candle feet, flat flame burner.	71.8	78.20
Candle feet, Met. No. 2 burner	96.9	105.07
Coke in producers, per cent. coal carbonized	11.7	13.9

One man runs the two benches of 9's in the installation taking care of the fires, and charging and discharging the retorts. His time is but partially occupied, however, and he could easily take care of several more benches.

There is also a most excellent article on the "Dessau Vertical Retorts in Sunderland," by Mr. Charles Con Drury (Journal of Gas Lighting, London, June 20th, 1911), also another article by Mr. J. P. Leather in the same periodical and the same date. In this same periodical there is also an article by Dr. F. Leisse under date of August 22nd, 1911.

It has only been within recent years that pyrometers have been used in the operation of water gas plants, but now there is hardly a water gas set built without one. They have solved a great problem.

There is no more trouble about the right heat, besides the old one man idea of operating a set. Wherever these instruments have been used they have more than paid for themselves. A very good report on their use is by Mr. Charles S. Heath, AMERICAN GAS LIGHT JOURNAL, May 15th and 22d.

The use of steam meters as well as air meters has more than solved the troubles of old, and we now get more efficient and regular results.

The subject of washing and scrubbing is now getting some thorough research work. In Germany, Herr Bowman has a new washer, called "The Kubierschky Gas Washer," and the article appeared in "Abstract" on this, under date of July 15, 1911. The question of whether sudden or slow cooling of the gas is now being thoroughly looked into, as well as the removal of naphthaline with tar, etc. Under date of May 30 and August 15, 1911, there have been two very good articles on these subjects.

One writer has been trying a continuous purification of coal gas from hydrogen sulphate in closed vessels. He tapped the upper ring in the concentrator so as to draw off any desired quality of liquor. This is cooled to below 86° F., and is pumped through the first scrubber, taking the place of the weak liquor usually employed. In trying this, the writer found that 150 grains of SH_2 were eliminated per gallon of liquor, and believes that, with ordinary gas liquor of about 1 per cent. ammonia, 1 gallon will purify 100 cubic feet of gas, and will free the gas completely from SH, without loss of ammonia. The ordinary liquor before admission to the concentrator will not answer, as its efficiency for SH, is small.

The subject of holders and tanks is also being thoroughly looked into, and there is hardly a day that some article is not written on this subject. The collapse of the large gasholder at Hamburg, which resulted in the death of 20 persons and injuring 50 others, is being deeply looked into. It will be remembered that the tank was built in the form of annulus, the inner wall of which was roofed over so that the interior could be used as a store room and cantine. Access to the space within was obtained by elevating the tank and supporting it upon 32 masonry piers connected by arches. The roof of the space within the tank was supported by trusses, one of which rested on the tank wall, the other on a central pier. This pier was composed of a steel structure about 27 feet 11 inches in diameter at the bottom and 39 feet high, and inclined towards the top. It rested on a hollow, masonry column about 27 feet 11 inches diameter at the top and 19 feet high.

Again the failure of the second largest gas holder in Europe is being thoroughly looked into. This holder was at Vienna and had a capacity of 8,830,000 cubic feet. It has just been finished, and the workmen were testing it with soap suds for leaks, when, for some unexplainable cause, it suddenly doubled up and the dome of the bell folded over the indented place.

Along this line, an abstract, by Mr. J. Alexander Mayers (AMERICAN GAS LIGHT JOURNAL, March 6th, 1911, page 451), might be interesting. A holder (erected at Harrisburg, Pa., last year) presents some novel construction features. The steel tank, which was 143 feet 6 inches in diameter, was mounted on a 1½-inch layer of dry sand, confined in place by a ring of grout run around under the tank bottom after lowering. The objection to the usual cement, or cement and sand bottom, is that, without premixing with water, a poorly bonded concrete is obtained, the irregular contraction of which causes strains and occasional leaks at the bottom plate joints. The holder was made with metal-to-metal joints, with practically no leaks to be caulked during testing. Former methods of rendering the joints tight were: Use of strips of lead, which was expensive; and salammoniac, which results in leaks with vibration and working of the plates, or, when applied too copiously, rusted the sheets. Caulking is only used in closing leaks during testing after completion. The Cruse Kemper Company, however, that erected the holder described, make a specialty of thoroughly caulking all outside seams while assembling during erection, which greatly diminishes the chances of future leakage.

The by-product end of the gas business is also receiving more attention every year; tars especially. The use of tar for road making is causing a big opening for tars, and the present question bothering the gas men is water gas tar. This is also a subject which needs a great deal of attention, as the numerous tar concerns do not care to purchase water gas tar; and, even if they do, the price is exceedingly low. The Road Board in England ("Gas World," April 29th, 1911), has published a complete list of specifications for road tar. The treating of timbers, paving blocks, etc., with creosotic oils or light tars is making a market for some of the poorer coke oven and water gas tar, though it is claimed that coal tar derivatives are more efficient in about the proportion 6 to 1.

Firebrick is also receiving more attention than ever, and the Institute of Gas Engineers of England has just adopted specifications. In Holland they are now trying a new refractory material called "Insolanda-stone," which will stand 2,732° F., and transmits but ⅓ as much heat as ordinary firebrick. The firm manufacturing this has also taken up the use of carborundum, and now issues a brick capable of standing 3,632° F., at this temperature, being exceedingly hard and taking no injury from tools. It does not alter dimensions or shape, and stands high pressure well.

J. G. Aarts has taken out a French patent for a retort material composed of silicium carbide mixed with a binder, preferably fireclay. It is claimed that the material will easily stand a temperature of 3,680° F.; will resist the mechanical action of coal and coke, even where the charge is continually moving; is impermeable to gases and vapors, owing to its great density and amorphous nature, and to the fact that it becomes vitrified at high temperature; it has five times the heat conductivity of ordinary firebrick material; and it does not shrink or expand whatever the temperature employed or however great the variations. It gravity is about 30 per cent. greater than firebrick. Entire retorts, sections or bricks, may be manufactured as in ordinary firebrick work, or they can be made by a direct method described in the specification.

In Germany they have also been making some very exhaustive experiments for preserving coal from atmospheric action. Under date of June 27th, 1911, in the "Journal of Gas Lighting," is a very good article, and, all-in-all, it showed that little is gained in keeping the coal in special atmospheres or under water though a submarine storage has been reported as being effective in other instances.

Messrs. S. W. Parr and F. W. Kressmann have made experiments in the University of Illinois, on "Spontaneous Combustion of Coal," an abstract of which is given below:

"Experimental investigations of the spontaneous combustion of coal, with special reference to bituminous coals of the Illinois type, were conducted at the University of Illinois Engineering Experiment Station from which the following conclusions were drawn:

"The oxidation of coal is continuous over a wide range of time and conditions, and begins with the freshly mined coal at ordinary temperatures. In general, it may be said that, for a given coal, a point exists, as indicated by the temperature below which oxidation is not ultimately destructive. The continuance of this point is dependent upon certain accessory conditions; if these conditions are withdrawn the oxidation ceases. On the other hand, above this critical point, oxidation is ultimately destructive and is characterized by the fact that it does not depend for its continuance upon external conditions, but is self-propelling or autogenous. The point of sutogenous oxidation may be indicated by temperatures of the mass ranging from 140° to 160° C., in an atmosphere of oxygen or between 200° C. and 275° C. in air, depending to a great extent on the fineness of division. Actual kindling does not occur until a temperature usually beyond 350° C. is reached. The more important elements which contribute toward producing autogenous oxidation are:

"External sources of heat, such as contact with steam pipes, hot walls, etc., heat of impact or pressure, due to the method of unloading or depth of piling; climatic or seasonal temperature at the time of storage; direct absorption of heat from the sun or from reflecting surfaces.

"Fineness of division; coal in a fine state of division presents a larger surface and brings a larger quantity of reacting substances in contact with oxygen than when in solid masses.

"Easily oxidizable compounds; a first or initial stage of oxidation exists in bituminous coals which does not result in the formation of CO_2. There are at present, in coals of this type, unsaturated compounds, which have a marked avidity for oxygen at ordinary temperatures, the products being humic acid or other fixed constituents of the coal texture. Iron pyrites: The presence of sulphur in the form of iron pyrites is a positive source of heat, due to the reaction between sulphur and oxygen. This is the second stage in the process of oxidation, and the rapidity of the oxidation is directly dependent upon fineness of division. Iron pyrites is a large component of the earthy or ash content in the fine duff, and the presence of dust or duff in all coals of the Illinois type is a positive source of danger. The heat increment, from the oxidation of only ¼ of this material, is sufficient to raise the temperature of the mass approximately 70°, because this oxidation may proceed with such rapidity that the heating up on the

mass will be but little affected by loss of heat due to radiation, except in relatively shallow piles.

"Moisture, while essential to pyritic oxidation, is given separate mention, because its importance is apt to be underestimated. Without exception, in all the series of tests, the wetting of the coal increased the activity as shown by the ultimate temperature. A third stage of oxidation of the carbonaceous material exists by reason of the tendency of certain of the hydrocarbon compounds of coal to oxidize with the formation of CO_2 and H_2O at temperatures in excess of 120° to 140°.

"The fourth stage of oxidation may be indicated as occurring at temperatures above 200° to 275°, and differs from the previous stages in that the action is autogenous and not dependent upon other sources of heat to keep up the reacting temperature. Activity in this stage is further accelerated by the fact that above 300° the decomposition of the coal begins, which is exothermic in character, thereby contributing somewhat to a further increase in temperature. The ignition temperature is reached at a point still further along, usuaily in excess of 300° to 400° C.

"As a result of a review of the literature on the above subject, it was found that only those coals containing large amounts of volatile matter are liable to ignite spontaneously, and that anthracite with its very low percentage of volatile matter is practically entirely excluded.

"Coals of exceptional purity are more apt to heat up than coals containing large amounts of extraneous matter. Opinions greatly differ as to the part played by sulphur compounds, especially pyrite, in the spontaneous ignition of coal; some believe pyrite to be the leading factor, while others believe it plays no part at all. The temperature of the coal undoubtedly is one of the main factors in the whole subject of spontaneous combustion, and the same is true of the fineness of coal. The relation of gases of inflammable nature occluded in coal to the spontaneous combustion of coal has not yet been clearly established. Opinions differ greatly as to what part moisture in the coal plays in spontaneous combustion, but it is generally conceded that the presence of moisture materially assists the pyritic oxidation. That the combination of oxygen with constituents of the coal causes a rise in temperature seems to be firmly established. The belief that pressure on the coal is due to the leading factors in the spontaneous ignition of coal seems to be gaining ground, and because of this fact it is advocated that coal heaps should not be any higher than 15 to 20 feet."

U. S. Geological Survey Bulletin, No. 475 shows some very good experiments of the diffusion of crude petroleum through Fuller's earth. It was found that Fuller's earth tends to retain the saturated hydrocarbons and sulphur compounds, thus exercising a selective action upon the oil. The Association of Gas Managers of Holland have now a special Committee on gas oils, and the results of their experiments are being watched with deep interest.

There is also a new registering steam meter made by the Apparate Baunastadt, Paul de Bruyn, Duesseldorf, which will also be quite a help.

The problem of converting the carbon monoxide in water gas into methane on a technical scale, by the Sabatier and Senderens catalytic method, has been solved in an experimental plant installed in England by the Cedford Gas Process Company. The working of this process in connection with by product coke ovens is contemplated.

All-in-all it is the firm conviction of this committee that a movement should be started, embodying all the Gas Associations in the entire country, to appoint and adopt a plant by which a Commission of Gas Engineers would be appointed, whose sole object would be thorough research work in this department and the results reported at the different meetings, making investigations of all new ideas, process, etc., and in the end it would mean, to each and every man in the gas business, a most beneficial and profitable venture.

Signed, E. C. Weisgerber, S. E. Linton, W. H. Warnick, } Committee.

Discussion.

Mr. Vincent—Mr. Weisgerber referred to the sale of water gas tar, and it is possible what he said is applicable to the larger plants. About 4 years ago Mr. Waring read a paper before this Association in which he told us how to dispose of water gas tar from the small plants for use as a dust layer and weed destroyer. This tar can also be used extensively for a post and shingle dip, and for painting hog pens and chicken houses, because it is a satisfactory mite destroyer.

Mr. Weisgerber—Being closely in touch with the situation, I know that the larger concerns are absolutely refusing to buy water gas tar; that is to say they will buy it at their figures, which often does not exceed ¼ cent a gallon. It is further stipulated that it may have been in settling vats for at least 3 months. I believe one of the largest companies in the United States has now established this custom all over the country. Water gas tar is really a drug in the market. We have more tar than can be used.

Mr. Vincent—As to settling water gas tar it is quite true the manufacturers will not buy it when it contains anywhere from 10 to 50 per cent. of water. Referring to the 1911 Proceedings, American Gas Institute, Part 2, page 60, one will find among a number of wrinkles, a very simple device for reducing the water. It costs very little to run, and it will take the water to less than 1 per cent. I think 3 per cent. is considered commercial tar.

Mr. Warnick—An effort was made by the committee to cover all the new ideas which have been brought out this year, in such a way that every one would get a slight conception, at least, of what attempts have been made and the results so far attained. Aside from this one of the things we put into effect in Omaha, in the way of increasing the capacity of water gas tar sets, is an automatic control over the supply to the carburetor. Being a very simple thing it can be installed quite cheaply. At the beginning of the blow a single stroke opens the carburetor valve, and, by means of a small air holder connected to the air supply, the carburetor is automatically controlled from that time on to the end of the blow. The features are that one allowed you to get more uniform heat regulation, and at the same time neither wasting any air nor allowing any unconsumed gases to go through the stack. Consequently, for a fixed amount of air and steam supply you are able to derive more capacity from the set.

The President—This paper is such an exhaustive one that I believe all here can much better get the result of its findings through reading it when published. A paper of such length bringing up as it does so many authorities, makes it almost impossible for a man to carry it in his head, thus causing the discussion to be exceedingly hard. Some points however that were brought out I think will be of interest to the engineers working in their gas houses, and a motion is in order for its acceptance. Certainly it should receive a more cordial reception from you.

On motion of Mr. Vincent the report was read and accepted (with thanks) for filing.

Mr. Weisgerber—I don't want to discuss this paper, but your Committee on Manufactures relates something at the end which I feel should not be let go by. Different gas associations meet every year in different parts of the country, and we hear papers read from which we get only the writer's individual idea. Now, one man doesn't know it all by any means. We have recommended the appointment of a commission of gas engineers who may together make this research and experimental work, and if we could present this to the larger associations, having them each appoint one or two men, I think we could make this a national movement.

The President—We are perfectly willing to leave the subject open. It looks to me like a very exhaustive one to discuss, and, as I said before, reading the report of the engineers will give the meat that is utterly impossible to get by hearing it read. As to a commission, that is up to the Association. I think, however, that is something a little bit beyond us. It is all right for our committee to bring these questions before a technical association like the American Gas Institute and wake them up, but I don't believe, as an association, we can wake them up as Mr. Weisgerber would like.

Mr. Weisgerber—There is nothing else like getting there first. Couldn't we consider that and appoint a committee to draw up suitable resolutions, and we, as the Iowa District Gas Association, could present them to the American Gas Institute? It would be a big thing for us if we would present resolutions recommending them to the American Gas Institute, and be able to say we are the prime movers.

Mr. Blackwell—I believe Mr. Burt is the member who represents our Association in the American Gas Institute. Would it not be right and proper that, at the next meeting of the American Gas Institute, we equip Mr. Burt, by proper resolution respecting our ideas in connection with this matter, and offer them our resolution for their action? As Mr. Weisgerber suggests, it is a good scheme to be No. 1 in these matters. We always claimed that the Iowa District Gas Association is the best Association in the United States, so the best things should come from the best Association. We should not wait until some other Association comes in and beats us to it. It is an important matter, I feel; and, just as Mr. Weisgerber suggests, a

commission appointed for that purpose would be doing much good by getting this information.

Mr. Kellogg—As I understand it, this Association has an affiliation representative to the Institute, so the present subject is a proper one to refer to him. I, therefore, move that proper resolutions be drawn up and presented to the official representative, with the request that he submit the same to the American Gas Institute. [Seconded by Mr. Blackwell, put and carried.]

Welcoming Inspector Green.

The President—It gives me great pleasure to tell you there is a gentleman in this hall to-day who has been invited by this Association to participate in our "Proceedings." Going a little farther than that we ask him to participate. Mr. Green is the Gas Inspector of Sioux City. We want him to feel perfectly at home, to ask questions or give us ideas that we might discuss, and enter into any of our discussions as if he were a member of this Association. As we said this morning, we have nothing to hide; we have everything for co-operation and nothing for opposition. Therefore, it will give us pleasure to have Mr. Green join us, and I feel assured you will all stand by me in this invitation I am presuming to make, for I know how you feel.

Mr. Green—I appreciate this invitation very much. As a city gas inspector I am the happy medium between the city and the company, yet it is anything but happiness sometimes to be between the public and the gas men. This meeting gives me an insight into the way you look upon these propositions. I can see that you are attacking the problem of manufacture. The resolution which you now have in mind, respecting a commission of one or more men to work out these problems, shows you are on the right track and are trying to do the right thing toward the public. Of course the public say that you are in it for all the money that you can get. That is certainly your business; but as long as you do the best thing for the public you show the right spirit. I appreciate your invitation very much, and shall be only too glad to enter into any discussions respecting which I feel capable of making any suggestions upon.

Mr. Fair—Apropos of Mr. Green's presence, I simply want to call attention to the fact this is the first time a gentleman occupying an official position similar to that of Mr. Green has accepted an invitation to take part in the deliberations of an Association like ours. It is a move in the right direction. and we trust he will come again, and that others occupying similar positions will too accept the invitation of this Association to be present as its guests and take part in the discussions. The impression still prevails in some quarters that a gas company is more or less of a secret society, and that its employees are bound by an oath or something of that sort; hence anything we can do to dissipate that most unfortunate impression all are most ready to do. Mr. Green's taking part in our discussions and getting our viewpoints and giving us his views, so that we can see the situation as it appeals to him, will be a great help towards a desirable outcome. We should all, especially those connected with small plants, throw open our works to people who are interested in the proposition. Let them see what we are doing and how we are doing it. Let them into your gas house, if they are not smoking, and put the "No Admittance" sign on the shelf.

(To be Continued.

Management & Commercial Methods.

Electrical Illumination, Democratic National Convention, Fifth Regiment Armory, Baltimore, Md.[1] By Mr. George E. A. Fairley, C.E.—As soon as the Democratic National Committee decided to hold the 1912 session of the National Democratic Convention in Baltimore, it immediately became necessary to prepare the Fifth Regiment Armory for use as a convention hall. The following description of the illumination and electrical wiring system installed in the building for use of the convention is hereinafter described, and shows the precautions which were taken and which were very necessary in an undertaking of this character. The architectural firm, who originally designed the Fifth Regiment Armory building, were retained to design and superintend all of the changes and additions required in preparing the convention hall. The writer was retained by the architects to lay off the electrical system installed and superintend the installation of same in conjunction with the architects.

1. "Monthly Journal," Engineers' Club, Baltimore.

The electrical illumination was designed not only for the use of the convention but to be, as far as possible, of a permanent character, suitable for use of the armory after the convention had adjourned. Therefore, the work was erected with this object in view, and practically all of the overhead illumination will remain as a permanent part of the armory equipment.

The first steps taken were to decide on the method and style of illumination to be used. Three different types of arc lamps and two different types of tungsten fixtures were installed, so that comparative tests could be made and an actual visual effect could be studied. After a series of tests it was decided to adopt the flaming type of arc lamp as the illuminating medium, as after considering the immense area to be illuminated, and also taking into consideration the current consumption and cost of maintenance and operation, it appeared to the officials connected with the work that this system would prove the most economical and satisfactory. Owing to the lack of a portable photometer the actual foot candle readings were not obtained, but a series of shadow tests were made on the floor of the armory and some idea of the intensity of the illumination can be gained when it is stated that a satisfactory photograph of the interior of the armory was taken at night time, without the aid of a flash light, with only 11 seconds exposure. The former system of lighting in the armory consisted of 70 old style A-C carbon arc lamps, and the illumination from same was not at all satisfactory. In place of the 70 lamps originally installed in the building, there were installed 49 Westinghouse flaming arc lamps of the latest type.

These lamps gave very satisfactory service with a minimum amount of the disagreeable flicker usually associated with alternating current lamps of the flaming type, and the distribution of the lamps was such that practically no flicker was noticeable on the floor of the building when all or part of the lamps were turned on. These new flaming arc lamps are to remain in the armory for future use. In addition to these lamps there was installed, on an entirely separate circuit, with a separate transformer, a system of exit and stairway lighting.

The stairway and exit lights were installed in this manner so as to avoid, as far as possible, a total interruption to the electrical illumination of the building. Each stairway and exit had a red light indicating same, and the outside stairway exits were brilliantly illuminated with 500-watt tungsten lamps. The speaker's stand was supplied with a row of wall sockets placed along the front edge of the stand.

View of Interior of 5th Regiment Armory, Showing Lighting Arrangement for National Democratic Convention.

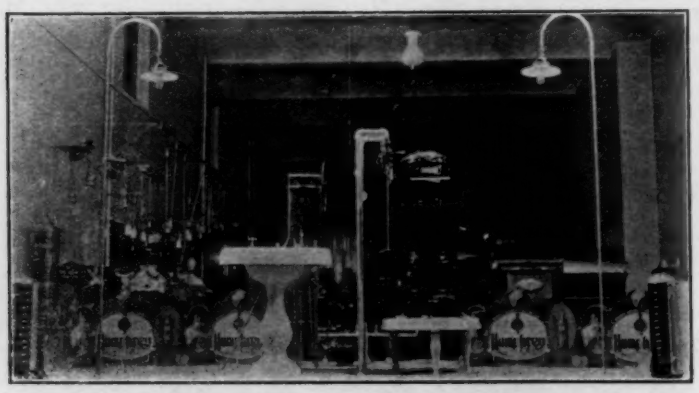
The Associated Press, the United Press, the Western Union and Postal Telegraph rooms were illuminated by drop lights installed temporarily for use of the convention. The main lighting circuits supplying the armory were supplied from a bank of 10 transformers, located at the northwest corner of the building. These transformers were connected so that the electric power could be obtained from two different sources, and an oil switch was connected at this point in such a manner that the lighting load of the building could be shifted from one source of supply to another in case of emergency. As mentioned above, a separate transformer was also installed to supply the exit and stairway lighting of the building.

The Consolidated Gas and Electric Company kept a force of men at the building, who were prepared to replace fuses or repair any trouble

which might arise and used every effort to prevent any interruption to the illumination during the long night sessions which have now become historical. As a matter of precaution, there were installed 8 gas arc lamps, also gas bracket lamps at the exits. A foreman from the Consolidated Gas Company was on hand at every night session during the convention. In addition to the armory electricians, an electrician from the Fire Department was on duty during all of the night sessions, and it is with a great deal of satisfaction that, with the assistance of the men mentioned above and the full co-operation of the Consolidated Gas and Electric Company's officials, there was not a single interruption to the lighting during the entire course of the convention. The electrical wiring was installed by the Lord Electric Company, of New York and Baltimore, and the Westinghouse flaming arc lamps were sold by the Southern Engineering Corporation. The illumination of the roof, which showed up so beautifully, was installed under the direction of Robert McCuen, Superintendent of Lamps and Lighting.

It is not the intention of the armory committee to use all of the arc lamps installed at one time, as the illumination is much greater than would be necessary for the ordinary drill purposes; but for special events, which will take place from time to time, the entire overhead illumination can be turned on, making it the most brilliantly illuminated armory in the United States.

How Manager Cook Did It in Traverse City, Mich.—Mr. W. L. Cook, the wideawake Manager of the Traverse City (Mich.) Gas Company, knowing quite well that the great lakes and the pine clad hills often send out winds that chill in the early fall, and also knowing that those shakers are sure to be followed by the heats of Indian summer, premonishes his customers that the gap between the first chill and the real appearance of Jack Frost may be bridged by using a log fire, and retaining the gas cooker and the instantaneous water heater, as sensible aids in the interim. This plan keeps the housewife as far as possible from the time when the furnace must be



brought into play. This year, towards the close of last month, for a week or more, he arranged a display in the window section of the Company's showrooms of Humphry Instantaneous Water Heaters, that not only attracted much attention but also brought in many orders for the apparatus in question. The picture tells the story much more readily than could any collection of words.

Baltimore's Industrial Building.—The "Industrial Building," which was formally opened in Baltimore, July 24th last, is an example of the constructive work of a public service corporation in aiding in the development of the resources of the community which it serves. This building, which is designed to provide every factory requirement for small manufacturers without capital expenditure, is the result of a suggestion made by President J. E. Aldred, of the Consolidated Gas, Electric Light and Power Company.

In directing attention to the desirability of providing such facilities in order to attract manufacturers and encourage the organization of new industries, Mr. Aldred announced that the two companies of which he is President would guarantee one-half of the stock, which it would be necessary to issue to erect such a building. Substantial interests in Baltimore co-operated, with the result that a $300,000 company was formed, the site purchased, and a 7-story and basement steel and concrete building erected, which is representative of the best engineering thought.

Items of Interest
FROM VARIOUS LOCALITIES.

With a view to supplying gas in Greencastle, Mercersburg and other settlements north of Hagerstown, Md., application has been made for a charter for a new Company. The promoters are intimately associated with the Northern Central Gas Company.

Advices from Los Angeles, Cal., under date of July 30th, are to this effect: "That a gas company may install its pipes in a public building, despite the protest of the owner, when a tenant asks for the installation, is the decision given last week by Judge Wood in an injunction suit brought by I. W. Hellman against the Economic Gas Company, of Los Angeles. Complainant sued to restrain the Company from placing its pipes in the buildings, 204-10 North Main street, declaring that the buildings would be damaged by the installation, and that in the event of fire resulting from gas escapes it would be difficult to determine which of the two companies could be held responsible, a competitive company having its pipes in the said premises. The Company's attorneys argued that to permit only one Company to install its pipes tended to create a monopoly, and that any tenant who believed he might be benefited by purchasing gas from another Company had a right to do so, despite the objections of the owner of the building."

The Endicott Union Gas Company's proprietors have been authorized by the Public Service Commission, Second New York District, to issue common stock in the amount of $25,000, and to make a mortgage of $150,000, bearing 5 per cent. interest, the proceeds to go to the construction of the proposed gas works for the settlements of Endicott and Union, N. Y.

Messrs. Henry L. Doherty & Co., 60 Wall street, New York, inform us that they are planning to bring out another subscription offering about October 1st, and have invited the participation of the workers associated with them in purchasing and carrying certain properties and securities which will compose a portion of this offering. The Gas Securities Company has issued $2,000,000 of 6's, with 6 per cent. notes. The notes may be purchased together with the right of subscribing for a like amount in the proposed offering with the pledge that no reduction will be made on account of over-subscription. Any one interested in this matter should make inquiry respecting it forthwith.

The Rochester (N. Y.) Railway, Light and Power Company has applied to the authorities for the right to extend its mains to and through the settlement of Charlotte.

"V. B. B.," is informed that Mr. John E. Hood formerly Secretary-Treasurer of the Knoxville (Tenn.) Gas Company, was elected First Vice-President of that Corporation, at a meeting of the Directors held in New York city about the middle of last month.

"M. T. M.," writing from Middletown, N. Y., August 5th, says: "Last week the Trustees, Village of Walden, N. Y., granted to Mr. B. J. McDonald and associates, a franchise to manufacture and sell gas in the named place. The life of the franchise is 35 years, and the Village is to be furnished free 120,000 cubic feet of gas, for use in the public buildings, and the Company is to file a deed of $10,000, to indemnify the Village against outlays on account of any legal sources in respect of damage cases. The Company proposes to supply the settlements of Monroe, Chester, Campbell Hall and Montgomery. It will further make a change in the service piping agreement, the Company to pay the first cost of laying 200 feet of pipe on service account."

The output of the Consolidated Gas Company, Boston, Mass., during July shows an increase over that of last year equal to 15.1 per cent.

"The Boys," writing from Boston, under date of the 5th inst., say: "Mr. E. V. Howe, Superintendent of the Arlington (Mass.) Gas Light Company, has again been promoted, this time to the engineering staff of the Light, Heat and Power Company, of Boston. Mr. Howe has been with the Company about 3 years having been Superintendent of the Leominster (Mass.) plant for 2½ years, prior to his being given charge of the Arlington works. This is the second promotion within 6 months."

THE gas rate contention between the authorities of Concord (N.H.) and the Concord Light and Power Company, over the net gas rate of $1.25 per 1,000, has been amicably settled, the authorities having consented to the Company's propositions to reduce the figure to $1.20 per 1,000, the quality of the gas to be at least equal to that heretofore supplied. The new rate became effective the 1st inst.

THE city authorities of Ludington, Mich., have expressed satisfaction over the activity shown by the Gas Company in increasing its main system. And the officers of the Company are congratulating themselves over the favor with which their efforts at bettering systems are being regarded. The output for the first half of 1912 shows a gain of 18 per cent. over the complete output for 1911. How is that for growth?

THE City Attorney of Battle Creek, Mich., is insisting that in any charter extension agreement between the authorities and the Company, there shall be inserted a provision directing that a tax of not less than 2 per cent. on its gross earnings per annum shall be provided.

CONTRACTOR R. C. GUPTILL is constructing for the Malden and Melrose (Mass.) Gas, Electric Light Power Company, a 2-story brick and concrete structure. Within the structure is provision for the storage of the power cars which the Company operates, a repair shop, a special charging room for the machines electrically operated, and suitable resting quarters for the Company's emergency crew.

A WASHINGTON (D. C.) Correspondent sends this under date of the 3d inst.: "The Commission of the District of Columbia have been notified by Mr. William B. Orme, Secretary, Washington Gas Light Company, that the Company will insist on the payment of $18.40, the former price, for each mantle gas lamp per annum in spite of the fact that the Commissioners, on July 8, directed the Company to maintain and furnish 6,613 lamps of 60-candle power each at the rate of $16.75 per annum on posts owned by the District. It is said that the reduction in price would mean a saving of $10,911.45 to the District per annum. In ordering a reduction in price of the 6,613 posts owned by the District that were being used before July 1, the Gas Company has questioned the authority of the Commissioners. Reduced rates on lights to be installed in the future are not questioned by the Company. A reduction of $4.40 per annum has been made in the case of arc lights where the District owns and maintains the posts. Each of these lights will now cost $14 per annum, the former price having been $18.40. The reduction in prices was ordered by the Commissioners, resulting from the act of Congress going into effect on June 28. An appropriation of $386,000 was made in this act for lighting the District of Columbia. The following extract from the act has a direct bearing on this case, and it was on account of this clause that the Commissioners ordered the reduction: 'For mantle gas lamps of 60-candle power, not more than $18.40. For this rate it shall be the duty of each Gas Light and Electric Light Company doing business in the District of Columbia to erect and maintain such street lamps as the Commissioners may direct, and each Company shall furnish, install and maintain all posts, lamps, lanterns, burners, wires, cables, conduits, gas pipes, street designations, and fixtures necessary for the respective lamps maintained by each of them, including lighting and extinguishing lamps, and repairing, painting and cleaning.' The Commissioners are, however, authorized by the act to purchase or construct out of the lighting appropriations posts, lanterns, and all other appurtenances. If this is done, the act further provides that $1.65 less be paid a year for each light."

MR. JOHN S. M. WHARTON, who has been acting Superintendent of the Peoples Lighting, Heating and Power Company, of Barre, Vt., since July 1st, during the latter part of the illness of the late Superintendent, Mr. G. H. Anker, has been appointed permanent Superintendent. Mr. Wharton is a graduate of Lehigh University, Class of 1909, with the degree of Mechanical Engineer. On leaving the University he entered the service of the Winchester Repeating Arms Company, remaining with that corporation 15 months. He then joined the constructing force of the United Gas Improvement Company, part of his active work therewith consisting of supervising the construction of the new water gas set for the Barre folks.

ACCORDING to the semi annual report of the Treasurer of the Laclede Gas Light Company, St. Louis, Mo., the net earnings for the first half of 1912 amounted to $954,512. The remainder, having deducted fixed charges, depreciation and preferred dividends, was $427,642—equal to 4 per cent. on the common. The gross was $15,637 in excess of the first half of 1911, and the operating expenses were $10,273 less. The rendered balance sheet shows a valuation of the Company's properties equal to $34,063,778.

THE quarterly report of the Treasurer (Mr. George A. Stiness), of the Pawtucket (R. I.) Gas Company, showed the gross receipts of the quarter to have been $49,490.46. The city's po undage on royalty account (2 per cent. of the gross) amounted to $989.51. This was in excess of the sum for like account the corresponding half of 1911, just $42.03.

THE manufacture of artificial gas in Calgary, Alberta, was discontinued the 25th July. The rate charged for natural gas is 35 cents per 1,000 cubic feet, net.

ABOUT as clever a thing as the new management or ownership of the Nashville (Tenn.) Gas Company has done was to appoint Mr. C. B. Hanley Commercial Agent.

MR. W. R. WONES, Engineer-in-charge of construction work on the new plant of the Anderson (S. C.) Company, declares that the citizens may certainly count on a gas supply by November 15. Main laying work is slow, but labor conditions in connection with the operation are rapidly mending.

THE Los Gatos (Cal.) has been granted permission by the State Railroad Commission to sell its plant and franchi ses to the Pacific Gas and Electric Company, at an upset price of $187,600.

THE generating plant of the Bellefontaine (O.) Municipal Gas Works is to be reconstructed. This is the concern as to which it was recently asserted had paid for the plant out of receipts. It looks now as if it had a very bad plant.

"B. V. M.," writing from Trenton, N. J., under date of July 31st, says: "I failed to note any reference in the gas man's authority to the recent action of the Public Utility Commission of New Jersey, in respect of the decision over the complaint of Mr. Henry Headley, Mayor of Ocean City, N. J., that the City Gas Light Company, of that place, should be forbidden to charge a rate for minimum service. The Company's charge on such account was $1 per month. The Commission ordered the Company to refrain from collecting the charge, and laid down the direction that the Company must charge only for the actual quantity of gas used, irrespective of the time which it took to use said quantity.

MR. FRANK L. FULLER President, the Public Utilities Construction Company, Philadelphia, Pa., and associates have applied to the authorities of Rock Hill for a franchise to construct and operate a gas plant in Rock Hill, S. C. They ask for a 30-year grant.

MR. T. B. BUCKWELL, of Toledo, O., since 1901 co nnected with the selling divisions of the Toledo (O.) Gas Light and Electric Company, has been appointed Sales Manager of the Peoria Gas and Electric Company, succeeding Mr. T. P. Pinckard, who removed to Windsor, Canada, there to take charge of the sales division of the local gas company.

THE State Board of Gas and Electric Commissioners has approved the petition of the proprietors of the Easthampton (Mass.) Gas Company for authority to issue additional stock to the amount of $100,000, for the purpose of paying off the floating indebtedness, and for additions to plant.

THE Rising-Sun Street Lighting Company's contract, under which it has been lighting by gas the side streets, parks and alleyways of Boston, has been extended for a period of six months, by Commissioner Rourke, of the Public Works Department with the approval of Mayor Fitzgerald. The rate to be paid is $23.60 per lamp per year.

A CORRESPONDENT forwards the following, from Lyn n, Mass., under date of the 2d inst.: "One of the most successful outings of the employees of the Lynn (Mass) Gas and Electric Company was the sixth renewal, held last week at Quannapowit Lake, Wakefield, to which the party adjourned in electric cars. The party left Lynn early in the afternoon and immediately after the arrival at the grounds the sporting committee began the program of sports which furnished no end of amusement. Basket luncheons were in order soon after the arrival of the Company at the grove. Boating, canoeing, bathing, baseball games and other athletic events were in order throughout the afternoon. It was not until the sun had disappeared below the horizon and the shades of evening had set in that the party recalled the fact that it was time to depart for the city of shoes. During the return trip the efficient committee in charge of the outing were the recipient of many compliments on the successful manner in which they had conducted the event."

The Market for Gas Securities.

Consolidated gas opened to-day (Friday) at 145¾ to 146, and several cash trades were made in it since last Friday. The usual mid-August rumors, reflecting possible changes in the composition of the huge concern—that is, the translation of the Consolidated into the New York Light, Heat and Power Company—are again floating through the financial centers; but of these, adieu. When the spirit moves then will the deal go through. And what a peach it will be. Meanwhile all sorts of investors should by this time know that the current figures are much lower than those somewhat approaching its real value—the latter is not a cent less than $300 per share.

Meanwhile Brooklyn Union is showing decidedly the effect of the taking out of the market of many small lots. Again, it is further asserted that Irving Place looks longingly towards Brooklyn Union and its potentialities. The shares opened to-day at 148 to 149. Peoples, of Chicago, gains steadily in favor, and Lacledes are also in some demand. U. G. I. is again on the rise, being quite near the 200 mark.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

AUGUST 12.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$78,177,000	100	145¼	146
Central Union Gas Co.—				
1st 5's, due 1932, J. & J.	3,000,000	1,000	103	105
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	105	106
Mutual Gas Co.	3,600,000	100	190	225
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	101	102½
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	35	50
1st Mtg. Gold Bds. 5 p. ct.	1,500,000	—	98½	100½
New York and East River—				
1st 5's, due 1944, J. & J.	8,500,000	1,000	103	105
Con. 5's, due 1945, J. & J.	1,500,000	—	95	100
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	100	109
Standard	5,000,000	100	60	70
Preferred	5,000,000	100	90	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	103	105
The Brooklyn Union	15,000,000	1,000	148	149
1st Con. 5's, due 1948, M. & N.	15,000,000	—	105¾	107
Yonkers	299,650	500	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	¼	⅝
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	500,000	1,000	97	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,350,000	1,000	59	60
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed				
Gold Bonds	7,660,000	1,000	104	106¼
Cincinnati Gas and Electric				
Co.	29,500,000	100	87	90
Columbus (O.) Gas Co., 1st				
Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. &				
Heating Co.	1,662,750	100	90½	91
Preferred	3,026,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	13,460,084		—	—
Mortgages, 5's	3,400,000		—	—
General Mortgage 4½	10,661,000		—	—
Con. Gas Co., Baltimore				
City, 4½	2,751,000		—	—
Consolidated Gas Co. of N. J.	1,000,000	100	15	—
Con. Mtg. 5's	976,000	1,000	94	96
Bonds	75,000	—	—	100
Detroit City Gas Co.	6,580,000	—	—	50
Detroit Gas Co., 5's	881,000	1,000	75	80
" Prior Lien 5's	5,619,000	1,000	97	100½
Equitable Gas & Fuel Co.,				
Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	133	136
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co.,				
1st Mtg. 5's	1,350,000	1,000	100	101
Hartford	750,000	25	190	200
Hudson County Gas Co., of				
New Jersey	10,500,000	—	130	138
" Bonds, 5's	10,500,000	—	104	106
Indianapolis	2,000,000	—	—	88
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	91	95
Kansas City Gas Light Co.,				
of Missouri	5,000,000	100	—	86
Bonds, 1st 5's	3,822,000	1,000	99	102
Laclede Gas Co., St. Louis.	10,000,000	100	106¼	106½
Preferred	2,500,000	100	90	100
Bonds	10,000,000	1,000	102½	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,370,000	50	120	110
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	106	
Massachusetts Gas Companies, of Boston	25,000,000	100	89¾	90
Preferred	25,000,000	100	95¾	95¾
Montreal Gas Co., Canada	2,000,000	100	233	236
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	97	98
Bonds, 6's	6,000,000	—	127	128
New Haven Gas Co.	5,000,000	25	182	190
Peoples Gas Lt. & Coke Co.,				
Chicago	25,000,000	100	117¾	118
1st Mortgage	20,100,000	1,000	102	102½
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104¾	105½
Pacific Gas and Electric Co.	15,500,000	—	66½	67
St. Joseph Gas Co.—				
1st Mtg. 5's	1,000,000	1,000	94	98
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	105
Extension, 6's	600,000	1,000	112¾	115
General Mortgage, 5's	3,447,000	1,000	94	96
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	101	103
Washington (D. C.) Gas Co.	1,600,000	200	420	425
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	—	—

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, October 16 to 18, 1912 Marlborough-Blenheim Hotel, Atlantic City, N. J. Officers: President, Ira C. Copley, Aurora, Ills. Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting and Gas Show, Toronto, Aug 26th to Sept. 7, 1912. Officers President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, New York City, Oct. 1912. Officers: President, R. M. Searle, Rochester, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street, New York City.

Gas Meters.—Monthly meetings. Chairman, Will W. Barnes; Commissioners, W. H. Pettes, L. W. Peffy; Secretary, H. Thurston Owens, 42 Pine street, New York City.

Guild of Gas Managers of New England.—Annual meeting, March, 1913. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, Walter G. Africa, Manchester, N. H.; Secretary, H. K. Morrison, Brockton, Mass.

Illinois Gas Association.—Annual meeting, March 19th and 20th, 1913. Chicago, Ills. Officers: President, H. O. Channon, Quincy, Ills.; Secretary-Treasurer, Horace H. Clark, 115 No. Oak Park avenue, Oak Park, Ills.

Illuminating Engineering Society.—Annual meeting, Niagara Falls, Canada, Sept. 16-19, 1912. Meetings of Sections, monthly. Pres't, V. R. Lansingh, New York City; Secretary, Preston S. Millar, 29 W. 39th street, N. Y. City. Sections: New York, Secretary, C. L. Law, 124 West 42d street. New England, Secretary, H. C. Jones, 10 High street, Boston, Mass. Philadelphia, Secretary, L. B. Eichengreen, Broad and Arch streets. Chicago, Secretary, J. B. Jackson, 28 North Market street. Pittsburgh, Secretary, J. C. Mundo, Oliver Building.

Indiana Gas Association.—Annual meeting, March, 1913, Indianapolis. Officers: President, Howard L. Olds, Indianapolis; Vice-President, Wm. Wallace, Lafayette; Secretary-Treasurer, Phimer Eves, Indianapolis.

Iowa District Gas Association.—Annual meeting, Burlington, Ia., May 22, 23, 24, 1913; Officers: President, C. W. Fair, Atlantic, Ia.; Secretary, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, October 17-19. Manhattan, Kas. Officers: President, B. F. Eyer, Manhattan, Kas.; Secretary and Treasurer, J. D. Nicholson, Newton, Kas.

Michigan Gas Association.—Annual meeting, September 4-6, 1912; Toronto, Canada. Officers: President, F. W. Blowers, Kalamazoo, Mich; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April, 1913; Joplin, Mo. Officers: President, P. A. Bertrand, Joplin, Mo.; Secretary and Treasurer, P. W. Markham, Brookfield, Mo.

National Commercial Gas Association.—Annual meeting and Gas Show, Dec. 2-5, 1912. Atlanta, Ga. Officers: President, C. L. Holman, St. Louis, Mo.; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, Cleveland, O, May, 1913; Officers: President, M. B. Daly, Cleveland, O; Secretary, T. C. Jones, Delaware, O.

New England Gas Association.—Annual meeting, February,———1913 Boston. Officers: President, D. D Barnum, Worcester, Mass.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—Summer Meeting. Sept. 21, Atlantic City, N. J.—President, William H. Pettes, Newark, N. J.; Secretary-Treasurer, Arthur H. Osborn Belmar, N. J.

Ohio Gas Association—Annual meeting, February ———, 1913, Columbus, O.; President, John M. Garard, Columbus, O.; Secretary, L. B. Denning, Columbus, O.

Oklahoma Gas, Electric and Railway Association.—Annual meeting, May, 1913. President, Noel R. Gascho, Alva, Okla.; Secretary, H. V. Bozell, Norman, Okla.

Pacific Coast Gas Association.—Annual meeting, San Diego, Cal., September 17, 18, 19, 1912. Officers: President, W. Baurhyte Los Angeles, Cal.; Vice President, Henry E. Adams, Stockton, Cal.; Secretary-Treasurer, John A. Britton, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, York, Pa., April, 1913; Officers, President, H. H. Ganser, Norristown, Pa.; Secretary-Treasurer, W. O. Lamson, Jr., West Chester, Pa.

Society of Gas Lighting.—Annual meeting Dec., 13, 1912. monthly meetings, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 29 West 39th street, New York city

Southern Gas Association.—Annual meeting, ———— 1913, ———— Officers: President, M Lege, Jr, Galveston, Tex.; Secretary, H. S. Cooper, 405 Slaughter Bldg., Dallas, Tex.

Southwestern Electrical and Gas Association.—Annual meeting. April————1913, Galveston, Tex. Officers: President, F. M. Lege, Jr Dallas, Tex.; Secretary, H. S. Cooper, Galveston, Tex.

Wisconsin Gas Association.—Annual meeting, May ——— 1913, Milwaukee, Wis. Officers: President, I. F. Wortendyke, Janesville, Wis.; Secretary-Treasurer, Henry Harmon, Milwaukee, Wis.